SCIENTIFIC AMERICAN

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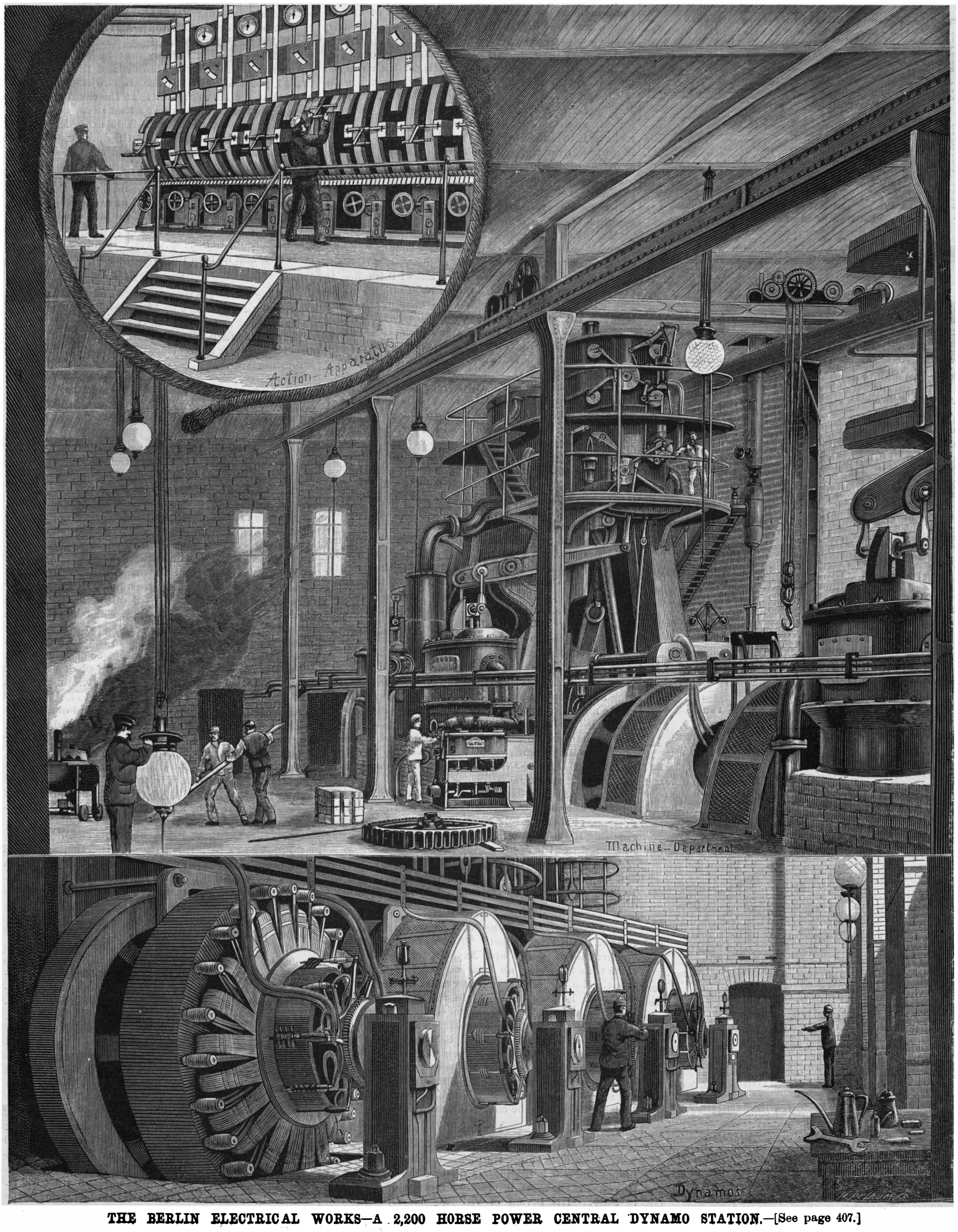

THE BERLIN ELECTRICAL WORKS—A 2,200 HORSE POWER CENTRAL DYNAMO STATION.—[See page 407.]

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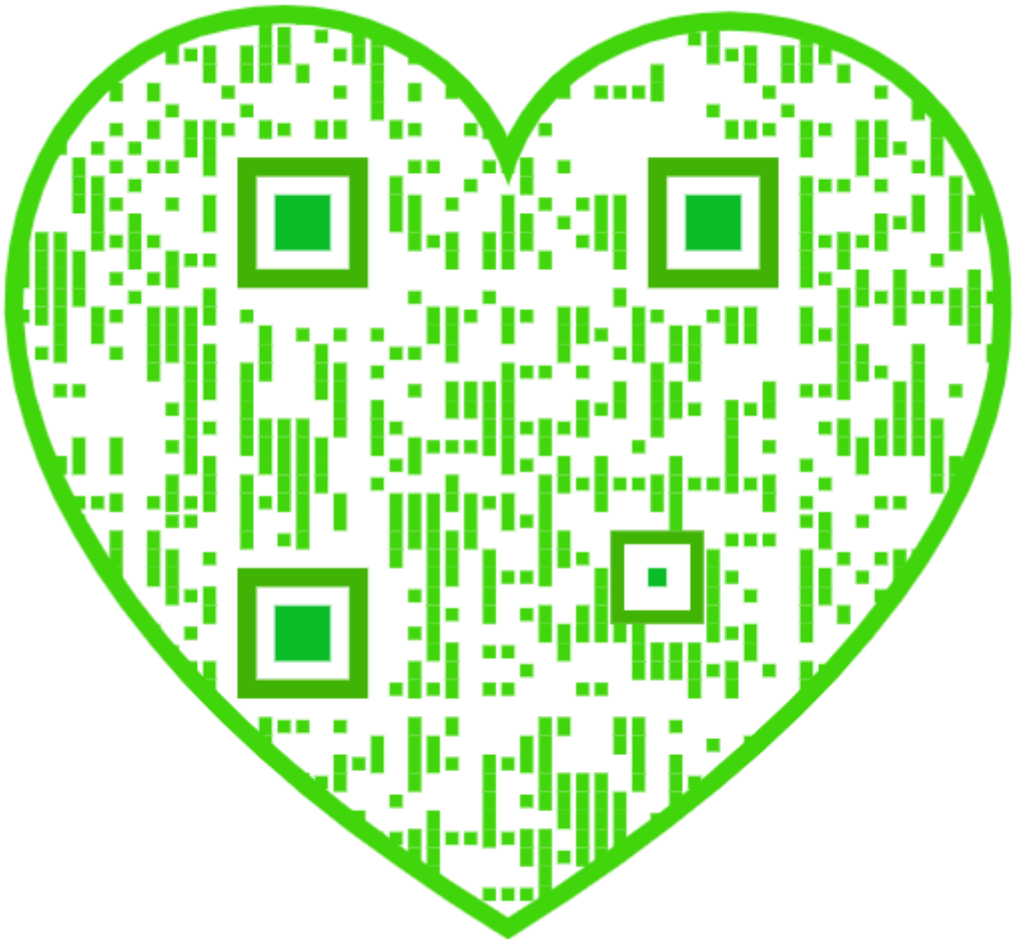

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DISAPPEARANCE OF ENERGY.

A correspondent writes: "It is a well known law that energy is indestructible, but a case came to my notice a short time ago in which it is hard to tell in what form the energy appears. A metal spring is placed under tension, and while in this state is fastened and placed in acid until it is completely dissolved. What becomes of the energy stored up in the spring? Is it turned into heat, and if so, how?"

Perhaps some of our readers will give their views in reply to this interesting query.

GOOD DOCTRINE IN REGARD TO PATENTS.

In a recent case of appeal from the examiner to the Commissioner of Patents, the complaint of the inventor was that the examiner objected unnecessarily to the language used in the claims, and thus obstructed and delayed his application. The majority of the examining officers very properly interpret their duty as lying in the direction of facilitating the inventor in obtaining his patent, but in some of the rooms in the Patent Office a contrary theory sometimes seems to prevail, and occasionally the practice is such that it looks as if the examiner considered his special function to quibble over words, even to the extent of delaying or defeating the inventor.

In the case above referred to, *ex parte* Pacholder, Mr. Commissioner Mitchell lays down very clearly the rules which should govern the Patent Office. Among other rulings he holds as follows:

"No general rule can be laid down for governing the employment in the claims of patents of such words as 'means,' 'mechanism,' and 'appliances.' It is the object of the law, as it is the solicitude of this office, to protect inventors and guard their inventions. This object is best secured in the case of patents which represent the maturity of an art by taking care that claims shall be drawn with all reasonable restrictions, so that they shall be valid in spite of everything that is contained in existing patents and of everything previously known or used."

"In the case of patents which represent the infancy of an art or the stage of its earliest practical development, this office is solicitous that the inventor should be accorded a breadth of claim which is commensurate with the extent and importance of the invention which he desires and is entitled to protect. While the office will insist upon as much definiteness in the language of the claim as the statute calls for, it will also, if it properly discharge its function as the protector of the inventor, leave something to the salutary and benignant agency of construction in the courts."

"There is a permissible latitude of choice in the use of language which may be safely accorded to the inventor or his solicitor without violating the statute, and without detriment to that branch of the public service which has for its object not only to grant letters patent for new inventions, but to grant them at the earliest possible date."

POSITION OF THE PLANETS IN JULY.

JUPITER.

is morning star until the 30th, and then becomes evening star. He takes the lead in the planetary honors of the month, for just before it closes he reaches the epoch in his course when the culmination of his size and brilliancy occurs. This important event is his opposition with the sun, which takes place on the 30th, at 7 h. 34 m. A. M. Jupiter in opposition is superb, as with majestic mien he traverses his celestial pathway, being visible the entire night. The midsummer starlit nights will owe their chief attraction to the beaming presence of this regal planet, rising soon after sunset, reaching the meridian near midnight, and fading away in the light of the approaching sun.

Jupiter rises on the 1st at 9 h. 14 m. P. M. On the 31st he sets at 4 h. 45 m. A. M. His diameter on the 1st is 44".8, and he is in the constellation Capricornus.

VENUS

is evening star. She shines with increasing brilliancy for two hours after sunset. The two brightest stars in the firmament, Venus and Jupiter, are visible at the same time for about an hour on the last week of the month, the former holding her court in the west and the latter holding his court in the east. Venus and Saturn make a close conjunction on the 17th, at 11 h. 36 m. A. M., Venus being 6' south. The planets are invisible at conjunction, but will be near neighbors on the evening of the 17th. Their approach, meeting, and passing will be worthy of observation.

Venus sets on the 1st at 9 h. 29 m. P. M. On the 31st she sets at 8 h. 56 m. P. M. Her diameter on the 1st is 13".2, and she is in the constellation Cancer.

SATURN

is evening star. He will be about 5° east of Regulus when the month closes, the increasing distance between planet and star being plainly discernible. His vicinity to Venus is the most interesting feature of his course in July. His period of visibility closes after this month.

Saturn sets on the 1st at 10 h. 15 m. P. M. On the 31st he sets at 8 h. 26 m. P. M. His diameter on the 1st is 15".8, and he is in the constellation Leo.

MARS

is evening star. He is stationary on the 4th, and then commences to move eastward, passing south of Beta Scorpii on the 30th, being at the same time about 5° west of Antares. Jupiter, Venus, Mars, and Saturn may be seen during the first half of the month shining in the evening sky, from the time when it is dark enough for the stars to appear until Venus sets.

Mars sets on the 1st at 1 h. 31 m. A. M. On the 31st he sets at 11 h. 47 m. P. M. His diameter on the 1st is 19", and he is in the constellation Scorpio.

MERCURY

is morning star until the 22d, and then evening star. He is in superior conjunction with the sun on the 22d, at 5 h. 19 m. P. M. He is in perihelion on the 15th, when, if Schiaparelli's theory that he turns only once on his axis during a revolution round the sun be confirmed, portions of his surface are subjected to a heat more than ten times greater than the earth receives at the summer solstice from a sun that never sets.

Mercury rises on the 1st at 3 h. 15 m. A. M. On the 31st he sets at 7 h. 43 m. P. M. His diameter on the 1st is 6".6, and he is in the constellation Taurus.

URANUS

is evening star. He is in quadrature with the sun on the 15th, at 1 h. A. M., may still be found northeast of Spica, and is favorably situated for observation.

Uranus sets on the 1st at 0 h. 12 m. A. M. On the 31st he sets at 10 h. 14 m. P. M. His diameter on the 1st is 3".6, and he is in the constellation Virgo.

NEPTUNE

is morning star. He rises on the 1st at 2 h. 18 m. A. M. On the 31st he rises at 0 h. 23 m. A. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Mercury, Saturn, Venus, Uranus, Mars, and Jupiter are evening stars at the close of the month. Neptune is morning star.

Curious Felting by Dermestids.

A correspondent of *Insect Life* writes to the editor of that journal as follows:

"I have in my possession a beautiful curiosity, and, as far as I can learn, the only one in existence. . . . It is an ordinary feather pillow tick, which was made of common bed ticking and filled with the domestic duck feathers about three years ago, and the pillow has been in general use about the house since that time. Of late the lady concluded to remove some of the feathers, as the pillow appeared too hard. Upon opening the tick, the feathers seemed to be ground up almost into a powder and unfit for further use; therefore they were emptied and the tick turned inside out, and instead of the goods being as when made, it was entirely covered with a fine growth of down, as evenly and thickly as the fur on a mole skin, which it very much resembles. It is firmly attached, the down breaking rather than pull off. Not a piece of the feather is attached to it, but as smooth as a piece of velvet, even the seams are covered by the growth. Not an insect can be found in the feathers, but the grinding process was supposed to be done by some insect. The lady made several pillows at the same time and of the same feathers, but when these pillows were opened nothing was found but feathers as when made. This was found about a month ago, and the ladies through the country have opened many pillows, some as much as fifty years old, but no such thing can be found. To look at it, one would think it the hide of some animal, and would never imagine it to be a pillow tick, except by close inspection."

Upon this Dr. C. V. Riley comments as follows:

"Pillows in which this felting of the ticking occurs have been infested by one of the Dermestid beetles (in all of the cases with which I am familiar it has been *Attagenus megatoma*) whose work has resulted in the comminution of the feathers, and the felting results from the subsequent mechanical action. The small feather particles are barbed, . . . and whenever caught in a cotton fabric by their bases, become anchored in such a way that every movement of the pillow anchors them still further. The frequent shaking which pillows receive results ultimately in the formation of this plush-like surface. A similar bit of ticking was exhibited at the Philadelphia Academy of Natural Sciences, April 5, 1883, and elicited the information that one of the members had, some years previously, examined a similar material known to have been formed from the fragments of gull feathers, and that a cloak had been made from it which wore well."

Deep Coal Mine.

One of the deepest coal mines in the world is at St. Andre du Poirier, France, and yearly produces 300,000 tons of coal. The mine is worked with two shafts, one 2,952 ft. deep and the other 3,083. The latter shaft is now being deepened, and will soon reach the 4,000 ft. level. The remarkable feature in this deep mine is the comparative low temperature experienced, which seldom rises above 75 deg. Fah.

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Organic Synthesis.

BY S. G. JENKS.*

The history of chemistry might be styled "A Comedy of Errors," for not only have there been errors, but errors of such a kind as to constitute a true comedy. An error is not such a bad thing, however, as it is sometimes thought to be, for sooner or later some one finds it out and states the truth. Then follows a conflict between truth and error, in which truth is victorious. Thus truth is not only established, but emphasized.

The first error that affected the development of organic chemistry in a noticeable way was the search for the "philosopher's stone." At present we see the inorganic branch of the science far more fully developed than the organic, but this is not due to the greater age of the former. The ancients, naturally enough, I think, became acquainted with organic bodies first. They used acetic acid in the form of vinegar very early, while probably the earliest artificially prepared salts were the acetates of the alkalies. They were also acquainted with various gums, resins, oils, and sugar, and made wine from grapes, and beer from malted grain.

Why, then, did not the organic branch of the science keep ahead in the development? The answer is to be found in the fact that the search for the "philosopher's stone" led men to investigate inorganic substances to the almost total exclusion of organic bodies. However, after a time, the idea that there could be found an "elixir vitæ," a remedy for all the ills of the body, was joined to that of the "philosopher's stone," and this led to the investigation of organic bodies in their medicinal relations. This brings us to about the fifteenth century.

Still, in the next century those interested in the medicinal chemistry gave so large a portion of their time to mineral substances, that only a few organic compounds, as benzoic acid, wood vinegar, milk sugar, etc., can be found mentioned in writings of their times.

Another error just here served to separate the investigation of organic bodies from that of inorganic, and to give prominence to the latter. This was the belief that, while the composition of inorganic bodies could be determined by synthesis as well as by analysis, that of organic bodies could not. This belief was so enduring that Gmelin in the first edition of his "Hand book," published in 1817, states that organic bodies cannot be built up by laboratory means from their elements; and about the same time Berzelius enforced the statement by a sentence in the introduction to his "Treatise," of which the following is a somewhat free translation. He says: "In living nature the elements appear to obey very different laws from those in inorganic nature; the products which result from the action of these elements differ from those with which inorganic nature presents us."

The veil thus thrown over the study of organic bodies was not lifted until 1828, when Wohler accomplished the artificial production of urea. This memorable event opened a new era in the study of organic compounds. Do not think, however, that this one discovery completely removed the errors just noted. This was only the beginning of a scientific conflict, and was not considered conclusive, since the urea was produced from ammonium cyanate, and this substance had not been prepared from its elements. Then, too, urea was a substance very easily decomposed into carbon dioxide and ammonia, and was only excreted from animal bodies, and must therefore, at most, be only semi-organic. We see to what extremities men will go to maintain a position once taken.

This discovery served to attract the attention of chemists to the subject, and other preparations followed. Then there came up various theories as to structure. The substitution of chlorine and other elements, known only in inorganic chemistry, for hydrogen, narrowed the gulf between organic and inorganic chemistry.

This last was carried to an amusing extreme in one case. Dumas had published his opinion that not only the hydrogen, but the nitrogen and oxygen in compounds containing these elements could be substituted by chlorine and still have a substance retaining the special properties of the original. This was too much for Liebig, who satirically replied that in manganous acetate he had replaced all the hydrogen, oxygen, and manganese, and finally the carbon, by chlorine, and that the resulting substance, although containing nothing but chlorine, retained all the characteristic properties of manganous acetate.

Let us take the following as an example of complete organic synthesis. Vapor of sulphur passed over glowing coke yields carbon disulphide. A mixture of iron and sulphur heated yields ferrous sulphide, and this treated with hydrochloric acid, whose elements need only sunlight to unite directly, yields hydrosulphuric acid. Pass a mixture of hydrosulphuric acid and carbon disulphide over red hot copper, and we have marsh gas. Treat this with chlorine, giving chloroform, which, when heated with potassium hydrate, yields methyl alcohol easily oxidizable to formic acid. This gives the list of methyl compounds by synthesis, and others are as easily prepared.

Thus it is proved that the indefinable agency which we call life does not supersede chemical force, but that the latter operates in the presence as in the absence of the former. This statement does not argue that there is no such agency as life, but rather that the author of both vital and chemical forces does not allow one to usurp the dominion of the others.

* A class essay read in the course in organic chemistry in the University of Michigan, October 30, 1889.—*Pharm. Era.*

Directions for Working Aluminum.

The following directions are given by the Scovill Mfg. Co., Waterbury, Conn.:

A cubic inch of pure aluminum weighs approximately one-tenth of a pound avoirdupois, being about one-fourth the weight of an equal bulk of pure silver.

Pure aluminum can be rolled, drawn, spun, stamped, engraved, burnished, polished, and soldered to the same extent and by the same processes as used on brass, with the following exceptions:

Annealing.—A very low and even temperature should be maintained in the muffle. Aluminum melts at about 1,300 deg. Fahrenheit—a very dark red. The inexperienced, therefore, cannot judge the proper annealing temperature by the eye alone, without danger of fusing the metal. When the metal has been heated enough to char the end of a pine stick, thus leaving a black mark in the wake of the stick as it is drawn across the metal, it is sufficiently annealed. The metal should then be withdrawn from the furnace and allowed to cool slowly in the air. For some work, such as stamping and drawing, it is sometimes better not to heat the metal so hot as to leave a dead black mark with the stick, but just enough to show a dark brown mark instead. Very thin sheets or wire can be annealed sufficiently for some purposes in boiling water.

Dipping and Pickling.—Remove the grease and dirt by dipping in benzine. To whiten aluminum, leaving on the surface a beautiful white matte, dip first in a strong, hot solution of potash, then rinse in water, and dip in undiluted nitric acid, 42 deg. Then wash in water, and dry as usual in hot sawdust.

Polishing.—Use fine white polishing composition or rouge, and a rag buff.

Burnishing.—Use a bloodstone or steel burnisher. For hand burnishing use either kerosene oil or a solution composed of two tablespoonfuls of ground borax dissolved in about a quart of hot water, with a few drops of ammonia added.

For lathe work the burnisher should wear upon the finger of his left hand a piece of Canton flannel, keeping it soaked with kerosene, and bringing it in contact with the metal, supplying a constant lubricant.

Very fine effects can be produced by first burnishing or polishing the metal and then stamping it in polished dies, showing unpolished figures in relief.

Scratch Brushing.—Polish or burnish the surface, and then use a fine steel scratch brush.

Soldering.—A special solder is necessary. Cleanse the metal from grease and dirt. Use for soldering fluid Venetian turpentine. Place the solder upon the metal with the Venetian turpentine, and heat gently in a blowpipe until the solder is melted. It will then be found to have fixed itself firmly to the aluminum.

Sand Castings.—Use open but very fine sand, and bake the mould. Large feeding gates should be provided, and the mould should be well vented. Pour the metal quickly, at a temperature but little above the melting point. Use either Taylor's or Dixon's plumbago crucibles.

Milling, Planing, and Turning.—Use plenty of oil to prevent the clogging of the tool and to make it cut smooth.

The Copyright Bill.

Recently the House of Representatives at Washington, by a decided negative, consigned to defeat the bill to provide for international copyright. Since that disastrous event; the sponsors of the bill have plucked up new courage, and are advancing once more to the attack, with drums beating, fifes shrilling, and flags floating, in the energies of the onward march.

We have received a large envelope containing an assortment of arguments in favor of the resuscitated measure, and we infer that we are expected to shoulder a musket and enlist for the war. That we certainly shall not do, because our convictions are with the opposition. Reasons are plenty as blackberries for defense of the position we have taken.

All through the controversy, the writings of an author for publication have been argued upon precisely as if they were property like "a house, a mine, a farm, or a ship," and the author's claim to compensation for its use as a natural right. According to that view, Shakespeare's plays were as much his property as his real estate, capable of being transferred, for an agreed upon consideration, from ownership to ownership, in endless repetition, down to our own day, the last owner farming out the right of publication for a royalty, and obtaining exemplary damages against any audacious publisher who should fail to respect that right. Such absurdity is a logical conclusion from the postulate that every literary production is property like bricks and horses.

In its article on copyright, the "Encyclopædia Britannica" says: "As a recognized form of property it is, compared with others, of very recent origin, being, in fact, the result of the facility for multiplying copies created by the discovery of printing and kindred arts. Whether it was recognized at all by the common law of England was long a question of the first magnitude; and the reasons for recognizing it, and the extent of the right itself, are not quite clear from controversy even now." Blackstone, in his long famous and standard "Commentaries," speaks doubtingly of the existence of such a right, and contents himself with mentioning the opposing views. All that groundwork constitutes a miserably poor basis for dogmatic assertions about an author's natural right in the publication of his writings.

In fact, nearly all those entities called rights are conventional creations. What may be right in one community may be wrong in another. In Louisiana, it is a legal right to conduct a lottery; in Illinois, it is a violation of statute law. In Turkey a man has a right to a number of wives; in the United States he is liable to be heavily punished for having more than one wife. Still further, every man's possession of what are termed natural rights, as to live, to speak, to walk, is under limitation. He may lose his right to live by committing murder. His right to utter his thoughts is complicated with his duty to obey the law against libel. His right to move about is restricted by his obligation not to go where his presence will be an invasion of somebody else's right of a different kind. Whatever right an author may have to the publication of his writings is circumscribed by similar metes and bounds. His right, like a multitude of others, is the creature of conventional agreement. In that way Congress acquired the power "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Before that provision had been adopted, copyright did not have any national existence in the United States. Even now copyright is regarded in law as only a privilege granted—a right arising from concession, and to be enforced by the courts only so long as the concession lasts. Natural right has no foundation anywhere in the language of the Constitution for the idea of natural or inherent property right.

Long ago Henry C. Carey characterized the issue now made as "the important case of authors *versus* readers—makers of books *versus* consumers of facts and ideas." He ridiculed the idea that an extension of a monopoly privilege would result in cheaper books for the people. The predominant question to be considered is one of public policy, not of authors' rights. This is the day of monopolistic tendencies and of alluring artifices under the disguise of seeking the general welfare. It is time to look after that welfare through the eyes of justice. Authors at present are secure in a copyright for forty-two years, among a population of sixty-five millions or more, likely to be one hundred millions within two decades, and affording the best market in the whole world for books. We repeat here what Henry C. Carey wrote nearly forty years ago: "The discoverers of principles receive nothing, but those who apply them enjoy a monopoly created by law for their use. Everybody uses chloroform, but nobody pays its discoverer. The man who taught us how to convert India rubber into clothing has not been allowed even fame, while our courts are incessantly occupied with the men who make the clothing. Patentees and producers of books are incessantly pressing upon Congress with claims for enlargement of their privileges, and are thus producing the effect of inducing an inquiry into the validity of their claim to what they now enjoy. Be content, my friends; do not risk the loss of a part of what you have in the effort to obtain more."—*Industrial World.*

Rope Transmission of Power.

The utility of wire rope transmission has become widely recognized. Not only among the rugged hills and mountains of the East and far West where streams go rushing down through caverns and rocky steeps, where no locations for mills or factories are afforded, is this means of transmission of precious power appreciated, but it is so convenient to use it that we find on the prairies of the West mills being operated at a long distance from water powers by the wire rope. A few days ago, on a trip through Nebraska, we noticed a rope stretching for nearly a mile from a water power to a mill that had recently been built adjoining a railroad, the owners finding it much more to their advantage to have it there, with the switching privileges afforded, than at the dam. The expense of hauling the flour which is thus saved to them will very soon pay for the system of power transmission.—*Modern Miller.*

A DISCOVERY of a large deposit of magnetite of fine quality has been made on the Antler River, about one hundred miles northwest of Port Arthur.

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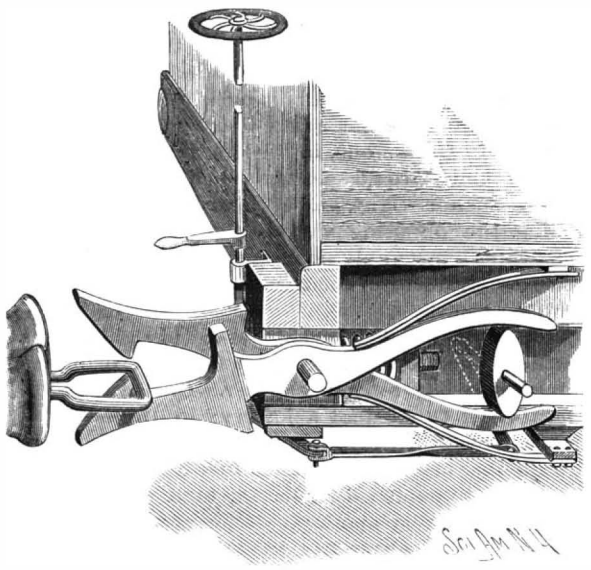
AN IMPROVED CAR COUPLING.

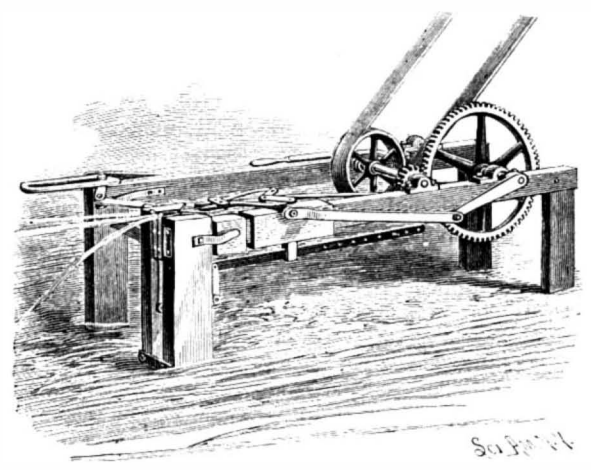
The device shown in the illustration is designed to act automatically in coupling cars, and afford ready means of uncoupling them from the tops or sides of the cars, thereby avoiding danger to the train men.



ARMSTRONG, BIGELOW & OSBORN'S CAR COUPLING.

The drawhead proper consists of two similar crossed sections, their outer ends having projecting jaws and latch hooks, and their inner ends having curved limbs, while the sections are pivoted on a transverse bolt in sliding blocks. The latter have slots to accommodate a bolt carrying a spiral spring on each side, and interior coils are preferably employed therewith in connection with the buffer plates. The springs in the sliding blocks are designed to hold the coupling sections normally projected a sufficient distance to permit free action of the latching portion of the drawhead. In order to hold the coupling sections in closed position, two curved plate springs, suitably connected with the car body, are made to bear on the top and bottom rearwardly extending curved limbs of the coupling sections. To spread the jaws and release the coupling, a cam block is supported between the limbs on a transverse shaft, there being on one side of such block a crank arm, to one end of which a connecting bar is loosely secured. The forward end of the latter bar engages a horizontal crank arm on the lower end of an upright shaft extending above the top of the car, where there is a hand wheel, by operating which the cam block is turned to spread the inner limbs of the coupler sections, and thus uncouple the cars. A lever is placed on the upright shaft, within convenient reach from the ground, whereby the uncoupling may be readily effected from the side of the car. The illustration shows also how this coupling may be employed in connection with a link and pin, a T-shaped link being then employed, which is gripped by the latch jaws, the other end of the link being adapted for attachment to the common drawhead.

For further information relative to this invention address Messrs. Armstrong & Bigelow, No. 110 Whitelsey Street, Ashland, Wis.



CURTISS' HOOP SHAVING MACHINE.

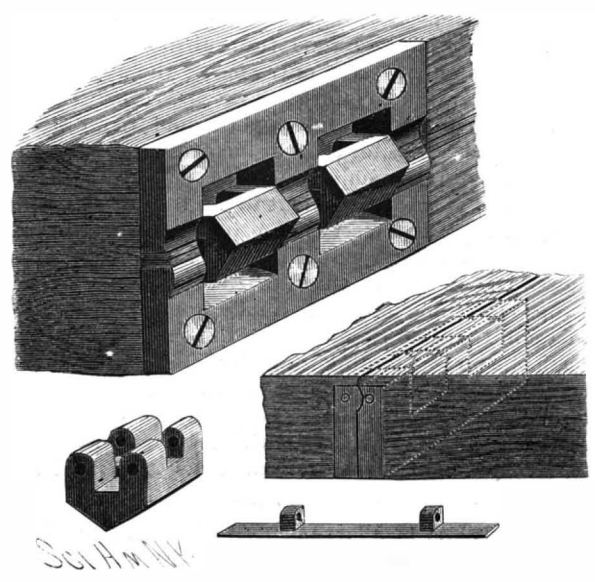
AN IMPROVED HOOP SHAVING MACHINE.

The illustration represents a machine adapted to shave and bevel all kinds of wooden hoops. It has been patented by Mr. William P. Curtiss, of New London, Ohio. The pulley supplying the power is loosely mounted, and has a clutch section adapted to engage a similar section of a clutch splined to the shaft, whereby the machine can be started or stopped as required, the shaft being connected by suitable gearing to the shaft which operates the working parts of the machine. One side bar of the frame has a carriage made in two parts, connected together on the inside by a slotted link, the carriage having tongs attached at the pivot of their jaws to one part, and by their arms to the other part through a toggle joint, the pivot of which is attached to a bar of the carriage connected with the pitman extending to the crank of the operating shaft. To the inside of this leg of the frame is pivoted the lower end of a post which is connected at its upper end with one end of a horizontally extending toggle joint, the other end of which is pivoted to a spring attached to the other side of the frame, and also projects beyond such pivot to a pivot in a slot of a slide on the frame, this slide being connected by a pitman with a crank on the other end of the operating shaft. To the top of the first leg and post are attached the shaving knives, and in proximity therewith are arranged springs to guide the hoop and a strip to prevent it from getting out of place, there being attached to the front of the leg a vertically moving slide carrying a plate to which are attached beveling knives. The end of the hoop strip being inserted between the shaving knives, the revolution of the operating shaft starts the inner end of the two-part carriage to straighten the toggle and close its jaws upon the hoop strip, the continued motion drawing the hoop its entire length between the knives and shaving it throughout. When the hoop is nearly shaved, a clip on the carriage strikes a pin whereby the beveling knives are raised to taper and cut off the hoop, the point at which this is effected being readily regulated.

AN IMPROVED HINGE.

The hinge shown in the illustration, which has been patented by Mr. McGuire Slane, is mainly designed to be used on pianos and fine furniture, including cabinet ware of different kinds, although adapted likewise for a general variety of work. It is a hinge which may readily be used either as an invisible or concealed one from the outside, or as a flush hinge, not requiring to be set deep in the wood. To make the hinge a convertible, invisible, and flush one, each leaf section is provided with an inner longitudinal cover having lugs on its inner surface, as shown in one of the small views, these lugs being arranged to be intermediate of the arms of the leaves, and to receive between them and the arms the links or yokes, shown in another small view, that unite the two joint pins of the hinge. With this arrangement the joint portion of the hinge is fully covered on the outside by the longitudinal covering strips, so that when the hinge is a flush one no joints in transverse arrangement to the joint pins will be seen. When the hinge is used as an invisible or concealed one, the recesses to receive it are not made through ones, but stop short of the outside surfaces, leaving a covering piece of wood over the longitudinal marginal portion of the hinge on which the joint pins are arranged.

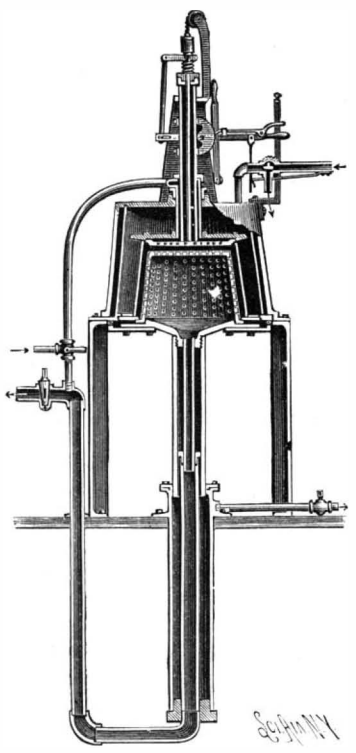
For further information relative to this invention address the Invisible Hinge Co., No. 818 Chapel Street, New Haven, Conn.



SLANE'S HINGE.

A MACHINE FOR MAKING ARTICLES FROM PULP.

The illustration represents a machine for making pails or tubs and like articles from pulp, in which suction is employed to draw the fiber into the mould, and to extract the water from it, while steam, compressed air, or other fluid under pressure is employed to press and form the pulp into its required shape within the mould. It is a patented invention of Mr. Charles M. Starr, of Edwardsburg, Mich. The outer chamber, into which the compressing fluid is introduced to effect the moulding, is in the form of a frusto-conical hood, its lower base flange secured to the top of two or more uprights from the floor, and there being held within it a conical perforated sheet metal distributer for the compressed air or other fluid under pressure. The inner perforated frustum of the mould has a perforated and flexible sheet metal cover or gauze applied to its sides only, and an outer cover of woven cloth, while a rubber bag is arranged at a suitable distance around such inner frustum, such bag being suitably secured below, and at its top secured to the under side of a hollow and perforated cap or die part, which serves to form the bottom of the pail. Centrally beneath the frustum is the cylinder of the hydraulic device and its elongated tubular piston for raising the frustum into its moulding position within the outer chamber, communication being established by pipes through the tubular piston with the interior of the frustum at its base. An air pipe leads to a short vertical tube at the top, whereby suction is produced in the mould by means of a pump, and within this tube is an upright sliding tube or hollow shaft through which the pulp is supplied under pressure, being admitted under control of a hand lever to the mould. When the mould is full, and the die cap lifted by the pressure below it, the supply of pulp is automatically shut off. When charging the mould with pulp, the pressure to act upon the pulp in the mould is preferably only admitted gradually, that the pulp may be more regularly and perfectly compacted, and this is effected by means of a clockwork escapement mechanism applied to a cock in the pipe which conducts the compressed air or other pressure medium to the mould.



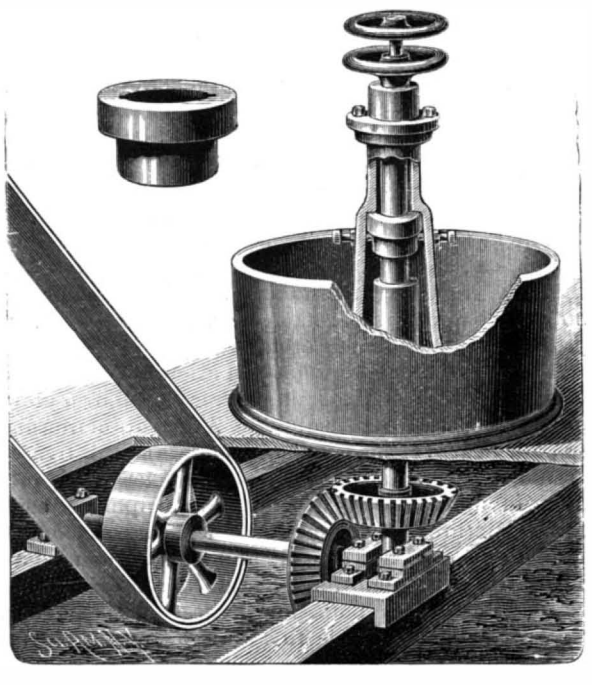
STARR'S PULP PRESS.

Water Courses—Rights of Owner of Land on which is a Spring.

The purchaser of land on which is a spring acquires as to the spring the rights of a riparian owner only. He can use it for any necessary and proper purpose incident to the land itself and essential to its enjoyment, but cannot divert the flow of it on the land of another for any purposes without answering in damages. Lord vs. Meadville Water Co., S. C. Pa. 20 Pittsb. Leg. Jour., 413.

AN IMPROVED COLLAR FOR GRINDING PANS.

The illustration represents an improvement in mining machinery of that class in which a muller is rotated in a pan by a driver mounted on a central power shaft, such as pan amalgamators, settlers, crushers, pulverizers, etc., the improvement consisting in the novel collar, shown in the small view, encircling the shaft carried by the driver. It is a patented invention of Mr. Theodore A. Washburn, of Gold Hill, Nevada. Above the power gearing and shafting, after the usual plan, is the pan with muller and cone center, around which is the driver extending up to the driver cap, the central driver shaft being feathered in the driver, and there being adjusting screws at the top. The collar lies within the driver, and has a flange on its periphery. It is featherwayed on the driver shaft, so that it will slide up and down as the shoes and dies wear, and through the driver passes three seven-eighths inch steel set screws, with jam nuts, under the flange of the collar, so that the collar will move up and down with the driver, thereby preventing the driver and muller from swinging out of their proper course. The collar, being a separate piece, can be readily renewed when necessary.



WASHBURN'S ADJUSTABLE COLLAR FOR PAN DRIVERS.

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Untidiness and Ruin in Shops.

Whether it is that untidiness leads to ruin or that a manufacturer who is losing money has not the moral stamina to keep things in trim, thrifty shape is a hard matter to determine, but true it is that untidiness in the shop and office and ruin are such close friends that they are ordinarily seen together, and the sight of one suggests the other. We have often seen men of rare industry, judged by their hustling manner, who would spend much time each day looking for tools they had forgotten where they left, stumbling over piles of stray castings left under the lathe or piled on or under the bench, or pawing those castings over for a piece somewhere in this pile or that, when it ought to be in a place by itself, going from tool to tool or bench to bench to find or borrow a drill or wrench or hammer or block, when there should be just one place to find the desired article. And when the articles are found, he never thinks of returning them to their proper place. In fact, there will be no "proper place" for tools in such a shop, and the next man who wants them will go on the same hunting expedition about the shop. Such a shop will always have black and dirty walls and ceiling, with windows splattered with dirt and decorated with cobwebs, notwithstanding that the light is so bad that careful work is rendered impossible or tedious of accomplishment, when a few pence worth of lime and a brush would whiten the walls and ceiling, and greatly improve the light, and so expedite and improve the work. Money and time are lost and ruin invited by a neglect of these things.

But the greatest loss experienced by this deplorable and needless state of things is in the *morale* of the shop. Workmen compelled to work in a dingy, ill-kept, and ill-lighted shop will suffer loss of ingenuity, loss of ambition, loss of self-respect and respect for their employer and his interests. If they are forced to work at disadvantage the stimulus to activity and ingenuity suffers a gradual decay, and no one will pretend to deny that this decadence on the part of the workman is not a direct money loss to the proprietor.

Tidy workshops stimulate manliness aud ingenuity on the part of workmen, and right here may be found the profit on the year's business, or if neglected the year's losses. There are plenty of establishments, east as well as west, which, by a careful attention to these matters—which they regard, in fact, as non-essential—could easily increase the efficiency of their workmen 10 per cent, and that per cent would determine the difference between a profit and a loss.—*The Pottery Gazette.*

An English Mummy.

A tomb has recently been opened in Canterbury Cathedral, for the purpose of discovering which of the archbishops it is whose body it contains. This is known to be one of three: Theobald, who died in 1139; Hubert Walter, who died in 1204; and Stephen Langton, who died about 1227. The investigation has not settled the point in dispute to the entire satisfaction of everybody; but the Society of Antiquaries in London have decided that the evidence is in favor of the body found in the tomb being that of Hubert Walter, who died in 1204, or nearly seven hundred years ago. The body found in the tomb, though it has been lying there nearly or quite seven hundred years, was in an extremely offensive condition; the smell arising from it was quite sickening, and unmistakably that of corrupt humanity. A number of articles of great antiquarian interest were found in the tomb and removed to the cathedral library. Most of them were in an excellent state of preservation. They were a silver chalice and paten as good as new, the archbishop's pastoral staff, a gold ring with large emerald having a curious device, silk boots ornamented with gold thread and garnets, a yellow silk miter, and embroidered stole.

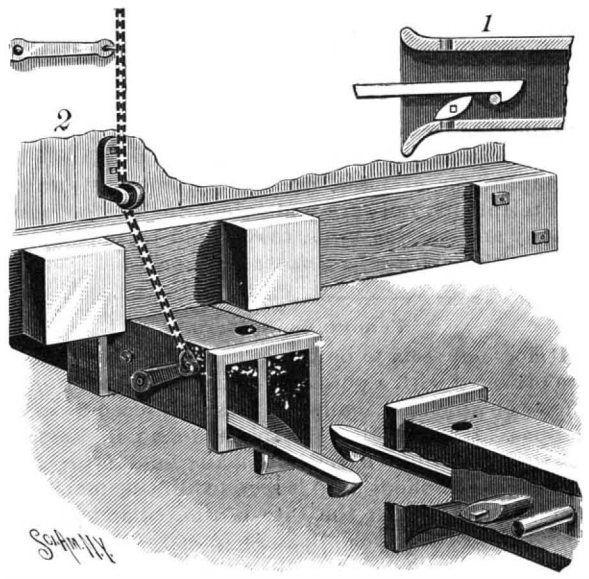
It appears to be easier to identify the remains of a distinguished personage of Egypt, who died four thousand years ago, than that of an English prelate dead for only seven hundred years. It might not be a bad idea to engrave upon the interior of the sarcophagus the name of the deceased.

British Patents in 1889.

According to the report of the Comptroller-General of the Patent Office for the past year, which has just been issued, the number of applications for patents in 1889 was 21,008, as against 19,103 in 1888; so that in the single year the number increased by nearly 10 per cent. The number of applications from the United Kingdom was as follows: England and Wales, 14,598; Scotland, 1,030; Ireland, 362; Channel Islands, 22; Isle of Man, 7—or a total of 16,019. The total number from British colonies and possessions was 343, of which Canada takes the largest number—100. For Europe there were 2,729 applications, of which Germany sent 1,336 and France 667; from Asia, 26; from Africa, 15; from America 1,875, of which the United States sent 1,857; and the Sandwich Islands, 1. The balance sheet shows that the receipts from fees amounted to £151,794; while the sale of publications brought £6,278. The total receipts (including the fees received for designs and trade marks) amounted to £172,820; the expenses to £79,286. The surplus for the year was £93,534.

AN IMPROVED CAR COUPLING.

The accompanying illustration represents a device designed to automatically couple cars, and with which they may be disconnected from the side or roof, while affording means of connecting cars by a link and pin attachment in case of accident to the improved device. The drawhead cavity is divided by a partition wall, and the hook bar is pivoted in the smaller compartment, on a transverse bolt which passes through both compartments. The lower wall of the drawhead at its front end has a downwardly and outwardly curved lip, producing a guiding incline for the entry of the hook bar of a similar coupling. In front of the bolt on



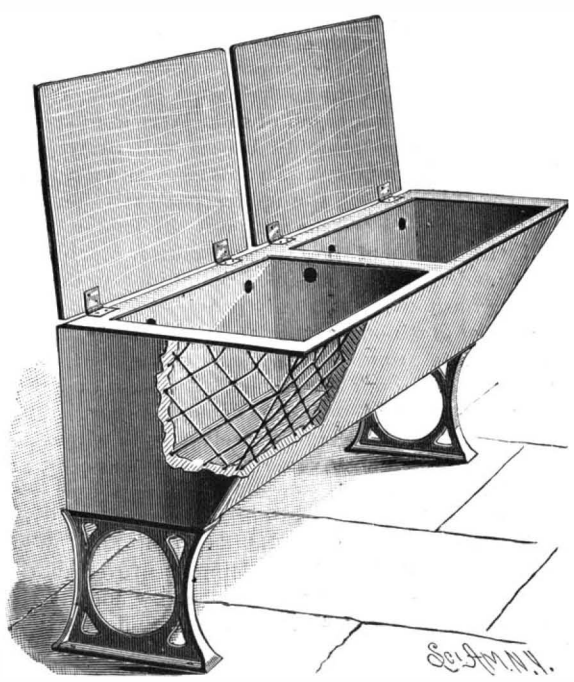
WILLIAMS & EDELSTON'S CAR COUPLING.

which the hook bar is pivoted, and nearer the bottom wall of the drawhead cavity, is journaled a rock bar, adapted to engage and vibrate the tripping blocks, as shown in the small view, one of these blocks being located in each of the compartments, whereby a limited oscillation of the rock bar will simultaneously elevate both of the tripping blocks sufficiently to release the hook bars of the engaged couplings. On the projecting end of the rock bar, at one side of the drawhead, is a rock arm having a chain connection with a depending pull bar supported near the roof of the car by sliding engagement with a bracket plate, there being also connected to this chain a horizontal lever pivoted on the end of the car, whereby the rock bar may be vibrated from either the top or the side of the car. The drawhead is vertically perforated near its front end to receive a coupling pin, thus providing means for the use of the ordinary link and pin coupling.

For further information relative to this invention address the patentees, Messrs. John J. A. Williams, No. 132 Fourth Street, and George J. Edelston, No. 617 Canal Street, New Orleans, La.

IMPROVED CEMENT SINKS, WASHTUBS, ETC.

The invention herewith illustrated, patented by Mr. John Moore, provides a novel manner of making washtubs, sinks, and other vessels of cement in combination with metal strips and woven wires, the wires being embedded in the cement to give strength and durability to the whole structure. The metal skeleton or frame consists of a continuous metal cap strip, which forms an outside protector to the rim or top of the vessel to keep the cement from being chipped. The cap strip is preferably made of a flat strip of pliable metal bent or doubled under on its opposite edges to give additional strength and present a good edge finish. The wire netting embedded within the cement is permanently soldered or fastened to the cap strip at the upper portions of the wires on opposite sides of the vessel, the wires being united below or at the bottom of the frame by doubling or twisting them around one another, or otherwise, the entire frame being thus compactly held together for the running of the cement about the wires.



MOORE'S CEMENT SINKS, WASHTUBS ETC.

For further particulars relating to this invention address the Union Granite Co., Guttenburg P. O., Union Township, Hudson County, N. J.

Furniture Beetles.

In the entomological part of the forty-first annual report of the trustees of the New York State Museum of Natural History, lately published, reference is made to the statements which have been advanced as to the long imprisonment of beetles within furniture. The writer suggests that when such cases occur the conditions may bring about a lethargic state, in which respiration and accompanying phenomena are almost or entirely suspended through the complete exclusion of air (a hermetic sealing) by the rubbing, oiling, varnishing, or other polishing which the furniture has undergone. As an instance of prolonged vitality, he quotes an extract from the third report on the insects of New York, by Dr. Fitch. In this passage Dr. Fitch says:

"In 1786, a son of General Israel Putnam, residing in Williamstown, Mass., had a table made from one of his apple trees. Many years afterward the gnawing of an insect was heard in one of the leaves of this table, which noise continued for a year or two, when a large long-horned beetle made its exit therefrom. Subsequently, the same noise was heard again, and another insect, and afterward a third, all of the same kind, issued from this table leaf—the first one coming out twenty, and the last one twenty-eight, years after the tree was cut down."

The evidence before Dr. Fitch convinced him that the insect was the longicorn beetle *Cerasphorus balteatus*, now known as *Chion cinctus* (Drury).—*Nature.*

An Old University.

The celebration of the six hundredth anniversary of the foundation of the University of Montpellier has been, according to *Nature*, most successful. All the great technical schools of Paris and the French provinces were represented, and deputations from many foreign universities were present. The proceedings began on May 22, when there was a great reception in the university hall. M. Chancel, the rector, welcomed the guests, and Professor Tedenat sketched the history of the university and its most celebrated professors. On the following day M. Carnot arrived. The delegates of foreign universities, followed by those of the great French schools, marched from the University to the Prefecture to be presented to the President of the republic, and if we may judge from a description by a correspondent of the *Times*, the procession must have been a remarkably interesting spectacle, the French and foreign professors being in robes of the most varied colors. The pavement and balconies along the route were crowded by men, women, and children. After the ceremony at the Prefecture the company proceeded to a park overlooking the town, commanding a view of the Cevennes on one side and the Mediterranean on the other. Several speeches were delivered under an awning. The rector of the university thanked the president for having honored the celebration by his presence. M. Croset gave a history of the university, and dwelt on the great trade of Montpellier in the middle ages, and its relations with the Arabs and Jews. Its most flourishing period, he said, was from the twelfth to the fourteenth century, and Petrarch spoke of it as a kind of ideal university. It made special progress in studies based on the observation of nature. The delegate of Bologna, the most ancient university represented, thanked M. Carnot for his reception of the foreign delegates. M. Bourgeois, Minister of Education, in a much applauded speech, said the government recognized the justice of the desire expressed by Montpellier and the other great schools to resume the name of university and the privileges associated therewith, and the question would shortly be discussed in the Chamber. We may specially note that the later proceedings included the presentation of an address by French men of science to Prof. Helmholtz, who represented the University of Berlin.

Automatic Photographing Machines.

A curious development of the "nickel (or penny) in the slot machine" has appeared in England. It is proposed to erect automatic photographing machines, corresponding in a general way to the other machines of this class for weighing, selling candy, etc., with which the public is now familiar. In the photographic machines a penny is placed in a slot, the person stands in front of a lens for about five seconds, being notified by the ringing of a bell when to cease posing. By the mechanism the plate is developed and fixed, and in forty-five seconds the photo is passed out to the purchaser. A second slot for halfpennies delivers a frame when one coin is dropped into it. It is claimed that the profit on each photograph is over one halfpenny. The chemicals used are a secret, and it is largely owing to their low cost that the figures given can be realized

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The Principal Discoveries and Inventions of the Present Century.

The following is a chronological *resume* of the principal discoveries and inventions of our century:

Electricity especially has been put under contribution by the inventive genius of our investigators. At the moment that we were entering upon the nineteenth century, Volta had just invented the electric pile (1789). In 1820, Oersted, the Dane, discovered magnetic electricity, the laws of which were soon determined by Ampere, and, in the same year, Arago discovered the principle of electric telegraphy, which was afterward improved by Morse, in 1838, and by Breguet, in 1845, etc.

In 1843, Bunsen, a German, invented a new electric battery, and two years afterward Elkampton and Ruolz discovered electro-metallurgy.

Along about 1832, Faraday discovered electrical induction, upon the principles of which Rhumkorff, the German, established the coil that bears his name.

In 1854, Bourseul discovered the principle of the telephone, which was improved by Reiss in 1860, and afterward by Bell, and especially, since 1876, by Edison, who also, at about the same epoch, improved the phonograph, the first idea of which belongs to Leon Scott, a Parisian proofreader, who suggested it in 1856.

Between 1841 and 1878 are embraced the discovery of and improvements in electric lighting, and along about 1881 the French engineer Deprez conceived the idea of transmitting any sort of motive force to a distance by means of an electric wire.

While waiting, then, until the fairy electricity shall have dethroned steam, let us register what has been accomplished through the latter: The establishment of railways after the manufacture of powerful locomotives had been rendered possible (1832) by the invention of the tubular boiler by the French engineer Sequin (1828), and then the establishment of steamers, to which, as long ago as 1838, was applied the screw invented by Dallery, of Amiens, in 1803.

While we are on the subject of the methods of locomotion, let us say that aerostation likewise has made great progress, although the last word will not have been said in regard to this until the question of the steering of balloons, which has taken a long step in advance through the experiments of Messrs. Krebs and Renard, has been absolutely solved.

Cork jackets have been improved, and, at the present time, there is a great deal being said about submarine boats, like that of the inventor Goubet, whose wonderful experiments a short time ago astonished the spectators assembled at the roadstead of Cherbourg.

In an absolutely different line of ideas, let us mention the silk loom invented by Jacquard between 1790 and 1801; the Davy lamp, which dates back to 1815, and which has rendered mine accidents less frequent; the sewing machine, for which Thimmonier, of Amplepuis (Rhone), took out a patent in 1830, and which, since improved by the American inventors, Walter, Hunt, Howe, Singer, Seymour, etc., and by the Frenchmen Maquaire, Hurter, and Hantin, etc., and to some extent also by the mechanics of all countries, has come into so common use; and, finally, the rotary cylinder press, invented by Marinoni in 1867, and which prints 40,000 copies of a newspaper per hour.

In optics, Fresnel, along about 1820, improved lighthouses through the use of lenses that now bear his name, and in 1829 Niepce and Daguerre invented photography. We shall some day return to the history of this admirable discovery and the chronological series of improvements that have been introduced, but for the present let us recall that one of the last of these in date is instantaneous photography, that is to say, the possibility of obtaining an image in $\frac{1}{100}$ and in $\frac{1}{1000}$ of a second even, according to a report read by Mr. Marey to the Academy of Sciences in 1882.

In agriculture, Dombasle, in 1822, improved the plow, in recent years the English, and especially the Americans, have conceived the idea of applying steam to the operation of all agricultural machines—plows, seed planters, mowers, etc.; finally, Messrs. Remy and Gehin, taking up an idea that Jacobi, a German monk, conceived during the last century, developed the science of pisciculture, which Mr. Coste has succeeded in extending along our coasts.

A certain number of discoveries have been made in the line of chemistry: In 1811, Gay Lussac discovered iodine, in 1826 Balard discovered bromine, and in the following year Wohler obtained aluminum, which, later on, Sainte-Claire-Deville succeeded in manufacturing in a purer state and at a lower cost. Finally, we may mention Chevreul's and Berthelot's discoveries in organic chemistry, and those of Boussingault and Payen, who created organic chemistry, and then the labors of Claude Bernard in physiology and those of Pasteur on ferments, microbes, and viruses.

Thus, while certain savants endeavor, through science, if not to diminish the number of troubles that afflict poor mankind, at least to lessen the effects of them, other men seek methods of destroying people in the most rapid manner, when occasion occurs. Diplomats and politicians justify the researches of these men by constantly repeating that in time of peace it is necessary to prepare for war. Let us accept their dictum, and since, even in our century, savants and artisans can attend to their labors only under the protection of guns, let us record the improvements in modern artillery by the German Krupp and the Frenchmen Reffye and De Bange, and the improvements in the rifle by Dreyse, Mauser, Remington, and Lebel. Let us not forget the invention of smokeless powder nor the use of new explosive substances (such as gun-cotton, dynamite, panclastite, roburite, etc., each more terrible than the other) in the manufacture of frightfully destructive weapons, such as bombs, shells, and the torpedo of more recent invention.

All these discoveries have an importance which, it is true, varies in degree, but it seems to us very difficult to classify them according to importance; at all events, it is not we who shall endeavor to do it.

Our readers already suspect us of having a marked predilection for certain of these discoveries, and if, in such a classification, we should chance to place photography, for example, upon a par with telegraphy and telephony, railways and submarine boats, phonography and vaccine virus, they would perhaps accuse us of taking sides.—*La Science en Famille.*

Venomous Spiders.*

It does not seem to be generally known that spiders are provided with a poison of a very active nature, the effects of which are similar to those produced by snake poisons. It is true that the spiders found in England are small and quite harmless to man; but it is probable that some poisonous fluid is secreted in the mandibles of all spiders—even the bite of the common house spider (*Tegenaria domestica*) is quickly fatal to flies and other insects on which it preys. Spider poison appears to have special effects on certain insects, and the largest flies are not always the least affected by it. Insects over which spider poison has but little influence are usually left meshed in the web to struggle until exhausted before the spider attempts to devour them. When a fly is bitten by a spider, its whole body seems seized by violent convulsive twitchings, and death generally occurs after a few minutes. The spider's poison issues from a sac and duct at the base of its mandibles. It closely resembles the venomous matter secreted by scorpions, and is a transparent fluid, containing traces of formic acid and albumen. There seems to be nothing characteristic in its microscopic appearance. When it is collected from the poison glands of several spiders and dried, it will retain its physiological properties for many years, and even after it has been subjected to a boiling temperature its properties are not destroyed. The spider is provided with a most effective apparatus for injecting its poison, consisting of modified mandibles, called falces, the last joint of which has a hard curved fang, with a fissure near the point. The muscles used in closing the mandibles also press upon the poison gland, causing the poison to be expelled through the fissure into the wound, and thence into the circulation of the victim.

The reader should watch a common house spider spin its web. Its seems to take pains, before beginning, to select a spot where there are chances of obtaining plunder and where it will be secure. It then discharges a little drop of glutinous fluid, and creeps up the wall, joining the thread from one wall to the other. The first thread thus formed is drawn tight, and fixed at each end with other threads. It is upon this outer thread that the durability of the whole fabric depends. The web's foundation completed, the spider next makes a number of threads parallel to the first, and then crosses them with other threads, the sticky substance of which they are formed serving to bind them, when newly made, to each other. It now commences to double and treble the threads that border its web, securing the edges as it does so. Lastly, it forms a kind of tunnel with webbing; this is to serve as a retreat, where it can conceal itself from its enemies and also from its prey, and is generally placed in the angle of the walls. When the spider's work is done, it often happens that the approach of some large animal or the passage of the housemaid's broom will destroy in a minute the labor of days. In this case, as soon as the danger is passed away, the spider patiently begins to repair the web. For this purpose the spider is provided with a store of the glutinous matter of which the web is made. When possible, the spider prefers the mending business, as it is only provided with a limited quantity of glutinous matter, and when this is exhausted it probably cannot be renewed. Old spiders, which have neither web nor the materials to make one, often hunt about to find out the webs of other spiders, younger and weaker than themselves, with whom they venture battle. The invader generally succeeds, and the younger spider is driven out to make a new web, and the old spider remains in possession until a stronger spider invades the web and drives it out. When thus dispossessed, the spider seldoms ventures another attack, but tries to subsist upon the few insects that may fall accidentally into its clutches, and eventually dies of hunger.

*A. J. Field, in *Knowledge.*

The well-known tarantula is one of the largest, but by no means the most venomous, species of spiders found in Europe. It belongs to the mining section of the family termed *Lycosidæ* or wolf spiders, and attains a length of three-quarters of an inch. The tarantula's body is covered all over with down, chiefly of an olive dusky brown color. The upper border of the thorax and the outline of the eyes are yellow, and the back of the abdomen is marked with a row of triangular dark spots with whitish edges. Their eight eyes are arranged in three transverse rows, the front row containing four small eyes, while behind there are two pairs of larger eyes. During the summer months the tarantula, while creeping among the corn, bites people employed in the fields, but the bite, though painful, is seldom dangerous. Dr. Zangrilli, an Italian naturalist, who has had many opportunities of observing people bitten by this spider, says that soon after the occurrence the part bitten becomes deadened, and in a few hours there are slight convulsive shiverings, cramps of the muscles, spasm of the muscles of the throat, followed by vomiting and a three days' fever. Recovery generally follows after copious perspiration, but in one case there was tetanus and death on the fourth day.

The tarantula is common in Spain, Southern France, and Italy, occurring in great numbers in Apulia round the town of Taranto; it has been found in Asia, and also in Northern Africa. The tarantula is to be found in dry places, partly overgrown with grass, and fully exposed to the heat of the sun, living in an underground passage which it digs for itself, lining it with its web. These passages are round in section, and sometimes quite an inch in diameter, often extending to the depth of a foot or even more below the surface. This spider is very quick in its movements, and eager in the pursuit of its prey; it waits only to kill one victim before it darts upon another, and it has been known to allow itself to be carried into the air by a large fly that it has attacked, rather than relinquish its hold. The female tarantula lays from nine hundred to a thousand eggs in a season, and shows considerable maternal care. When the number of eggs she has brought forth have remained for an hour or two to dry after exclusion, she prepares to make a bag for them. For this purpose she spins a web and lines the inside with down which she plucks from her breast. Within the bag, which is almost as thick as paper, the eggs are deposited, and it is then fastened, by means of the glutinous fluid she secretes, to the end of her body. The female tarantula has never been known to abandon her offspring until they are able to take care of themselves. She hatches two broods in the year, in spring and autumn, and has been known to hatch three. The eggs are not adherent to each other in the cocoon. When the young ones are excluded from their shells within the cocoon, they remain in this confinement until the female, instinctively knowing their maturity, bites open the bag and sets them free. The young of web-making spiders after leaving the egg immediately commence weaving, but the young tarantula (leading a vagrant life, and having no web), being incapable of protecting themselves, remain for about a fortnight with the mother, giving rise formerly to a belief that they derived their nourishment from her body.

Railroad Building in Jamaica.

Since the first of the year things have changed considerably in and about Porus. Then work on the railroad had not been begun; now upward of a thousand negroes are at work, and in consequence yams, the staple article of food, have gone up in price. The first section of two and a half miles is approaching completion, and work is under way on the second section. A number of bridge and culvert abutments are up, built entirely of concrete. It would strike a person ignorant of the country as rather strange to see so many waterways staked out in places, not only where there are no streams, but where the work is actually delayed for lack of water to mix the concrete. The rainy season that is coming on will tell a different story. The mild manner of "driving" laborers, and the bland and unconscious manner of receiving the driving, afford a striking contrast to railroad methods in the United States; as does also the way in which material is handled. Carts are dispensed with. Men fill square boxes, which women, for the greater part, carry off on their heads and empty. The carrying of things on the head is here reduced to a science. Everything, from a sucking pig tied on a board to a can of water, is so carried. The negro who carries the transit instrument in the field at first, in the most matter-of-fact way, lifted it to his head. The water boy carries a 30 or 40 pound can of water thus over rocks, where others are often inclined to crawl. World's Fair preparations for 1891 are going on, notwithstanding the opinion of many that it will be premature. Efforts will be made to interest American exhibitors. American road wagons, to take the place of the clumsy mule drays used here, could be exhibited with advantage; as could machinery for preparing fiber for rope from plants with which the island abounds.—*N. Y. Tribune.*

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THE BERLIN ELECTRICAL WORKS.

There has, unquestionably, been greater improvement in electric lighting during the latter half of our century than in any other department of technology, says the *Illustrirte Zeitung*, for which we are indebted for this description and engraving, and this improvement has given us a source of artificial light which cannot be surpassed, for electric light ranks next to sunlight. Assuming that the part taken by German science and German invention in the development of electricity as a practical means of lighting is well known, we will speak here only of the plant that supplies electric light to the German capital, which stands in the first rank of the cities of the world.

Five years ago the Edison-Gesellschaft, now the Allgemeine-Elektricitatsgesellschaft, erected a little plant for 2,000 lamps at No. 85 Friedrickstrasse. When the Allgemeine-Elektricitatsgesellschaft obtained permission from the city to use the streets for laying electric cables, a second central station was built in Markgrafenstrasse, which was much larger than any similar plant. It had a capacity of 1,000 steam horse power. A third small station, with three engines of 270 horse power each, was erected in Mauerstrasse, but in 1887 three more engines of 300 horse power each had to be added to the plant at this station. In the beginning of 1888 the station in Markgrafenstrasse was found to be too small, and had to be enlarged by the addition of four steam engines of 300 horse power each. Then a fourth, a fifth, and finally a sixth station were erected, and they were each provided with vertical engines of 1,000 horse power. The electric light machines, dynamos of the newest type, were supplied by the firm of Siemens & Halske. Each of these machines, the ring armature of which has a diameter of from 2½ to 3 meters, supplies electricity for incandescent lamps of 90,000 candle power; that is, about 6,000 lamps of 15 candle power each.

Our illustration shows the above mentioned central station in Markgrafenstrasse, the building of which, on account of the expensive situation of the ground, is carried up high as possible, instead of being spread out. The engines are built like hammer machines, and are of the compound system, with two cylinders placed one above the other. The tubular boilers are in the story above the engines. The dynamos are coupled directly to the shafts of the steam engines, thus avoiding a complicated system of belting. In order to allow for driving the dynamos in this direct manner, they had to be arranged for a much smaller number of revolutions than had been customary, and therefore they were constructed to deliver, the required electric current while operating at the rate of 85 revolutions per minute.

A very important part of the plant is the switching apparatus, with the switch board. By means of the levers of this apparatus the different groups of lamps are brought into the circuit or cut out, as is desired or required, while the measuring and controlling apparatus attached to the switch board permits an oversight of the supply of the current delivered by the dynamos to the different sections of the system. Other apparatus serve for equalizing the current in the network of wires, for testing the insulation of the conductors, etc.

The electricity produced by these dynamos is first carried by heavy copper conductors to the switch board, and from there to the cable vault, from which it is carried to the street conductors. These street conductors, which are embedded sufficiently deep below the pavement, consist principally of cables, the twisted copper wires of which are properly insulated, incased in lead pipes, and then protected from external injury by iron bands.

The driving power of the entire electric plant of Berlin will amount to 18,000 horse power, when the central stations are completed, which corresponds to an addition of 200,000 lamps, that will have a lighting power equal to 25 per cent of all the gas lights in Berlin.

Tin.

Tin, which every one knows, but which few, except men of science and metallurgists, are acquainted with, is one of the most precious and most interesting metals. After gold and silver, it is intrinsically the most precious of those in use. It is nearly of the same color and almost as bright as silver, but has less resistance and is less valuable. When warmed by friction, it has a pronounced odor and taste. When it is bent, the derangement of the crystals of which its mass is formed causes it, without any fracture taking place, to emit a peculiar sound which metallurgists call its cry, and by means of which an expert can nearly determine its degree of purity. The places where tin is produced are few, scattered sparsely over the surface of the globe, and it disguises itself under the form of a blackish mineral which, to the profane eye, gives no sign of the treasure that is within it.

One of the richest as well as most ancient tin mining districts is in the Malay Peninsula, the Golden Chersonesus of the ancients. The name of the province, Pérak, signifies silver, but it is peculiarly the province of tin. The use of tin dates from extreme antiquity. Homer mentions it as *kassiteros*, in the descriptions of the arms of his heroes. Herodotus speaks of the British Islands as the *Kassiterides*. The Phenicians obtained the tin which they furnished to the ancient world chiefly from those islands, but partly also from Gaul and the Iberian Peninsula. Before the Phenicians and the Greeks, however, the Chaldeans knew this metal under the name of *kastira*. The most ancient document in which a mention of it has been found is probably a hymn to the fire, which M. Oppert has translated from the Acadian language, a tongue the knowledge of which has been recently revived from cuneiform documents. Tin was designated in them, five thousand years ago, as *anaku*.

The Biblical text in the book of Numbers in which Moses names tin in the enumeration of the metals is therefore comparatively modern, for it is of fifteen hundred years later date than the hymn to the fire. Even more definite than these texts is an Egyptian statuette in bronze (an alloy of tin) of the age of the pyramids, or 3,600 years B. C. Let us return to our own age, and see what is the present annual production of tin. In a recent book on the Industries of the Netherlands, M. De Ramaix gives as the production of the Dutch East Indies 10,000 tons, of Cornwall 8,000 tons, and of Australia 7,000 tons, in all 25,000 tons. These figures show that the English mines have fallen off since the days of the Phenicians, when Cornwall was the principal center of production. They have been left behind by the Dutch East Indies, and will soon be overtaken by Australia, if the number, 7,000 tons, given as the present production of its mines, is not exaggerated.

Saxony and Bohemia, which still figure in the cyclopedias as sources of tin, are not mentioned in M. De Ramaix's estimate. A graver omission is that of the Malaccan mines, which I have mentioned as the most ancient, and also perhaps the most productive. According to Mr. Patrick Doyle's Tin Mining in Larut (London, 1879), the Malay states of the Malaccan Peninsula exported to Penang in 1877, in round numbers, 2,500 tons of tin, and the Siamese states of the same country 7,000 tons, making 9,500 tons in all. From personal information, I estimate the exportation from the single Malay state of Perak, in 1881, at 6,139 tons. The production of the Peninsula having grown steadily since 1876, I believe I can assert that it now takes the lead among tin-producing countries, and that the world's total present annual production of this metal is not less than 45,000 tons. Yet this production is hardly sufficient to supply the needs of existing industry, for the price of tin before the crash in copper, by which it was also affected, had reached the high figure of $800 a ton.—*Popular Science Monthly.*

Oilcloth.

The body of oilcloth is what is called burlaps, made of jute and imported from Scotland. This coarsely woven fabric is limp, and is stiffened by being passed through a mixture of starch and glue and over hot rollers, coming out, it might be said, laundried. It is then ready for the paint machine, where it is given the body. There are four qualities of oilcloth, depending on the number of body coats of paint. That which is to be the best quality receives five or six coats; the poorer grades, a less number. The cloth, in pieces twenty-five yards long by two yards wide, is dried in racks which are constructed in tiers of twenty. The factory has a rack capacity of 11,000 square yards. The thickness of each coat of paint is governed by a steel knife, in manipulating which a workman becomes so proficient that he can tell nearly to the pound what a piece of cloth will weigh when the coating process is completed. Three men at a paint machine can turn out in a day one hundred pieces containing fifty square yards each. The operation of coating the first quality cloth occupies a week, as each coat requires twenty-four hours in which to dry. It is then sent to the rubbing machine, where surfaces coated with glue and sand pass rapidly over the side which is to be printed, ridding it of all irregularities. The better qualities are afterward given another coat of paint, when they are ready for the printers. This is the most interesting part of the operation. For every color in the pattern to be transferred to the oilcloth there must be a block. These blocks come from Maine. They are about two inches thick, two feet square, and are composed of several layers of wood. The surface to be used is of maple, crossed and recrossed by narrow grooves, which form a surface of small squares, 144 of them to the square inch. Those squares look like, and are in reality, so many pegs. Where the pattern is desired to show, the pegs are left standing, those on the portion of the surface which is not to be printed from being cut away. The styles in pattern change twice a year. Some are designed in Utica, and others come from Philadelphia and New York. Some patterns containing many colors require from twenty-five to thirty blocks, and consequently that number of impressions, to reproduce the design. Rug patterns are the most difficult to make, as it requires different blocks for the corners, sides, and the center. The printing is done on the top floor, so that the oilcloth can hang for a distance of fifty feet to dry. Each printer has a table with eight pads, on which he smears his colors. Pressing a block to the pad containing the required color, he transfers it to the surface of the cloth, using hand pressure only. Having done this with every block, as each transfers but one color, and consequently but a small portion of the complete design, he has finished about four feet square of printing, and goes about repeating the operation on another portion of cloth, and so on. Two men generally work at a table, and can turn out from 100 to 150 square yards of oilcloth a day, when printing seven or eight color patterns. The paint used is similar to the ordinary house paint. When the printing is completed, another block is pressed on, which gives the embossed surface, of which there are two kinds, pin and line finish. The wet cloth then hangs from the loft for a week, when by an ingenious mechanism it is transferred to the drying room, where for another week it remains in a temperature of 130 degrees. The door to this dry room is fifty feet high, allowing that length of oilcloth to be passed through without rolling or bending. Coming out, it is varnished, three men, with the aid of a machine, varnishing 6,000 yards a day. Next it is trimmed and the cloth is ready to be shipped.—*American Analyst.*

Cautions for Young Men.

Mr. Andrew Carnegie gives the following advice, intended for young men, but which older men may heed to their advantage:

"There are three great rocks ahead of the practical young man who has his feet upon the ladder and is beginning to rise. First, drunkenness, which, of course, is fatal. There is no use in wasting time upon any young man who drinks liquor, no matter how exceptional his talent. Indeed, the greater his talents are, the greater the disappointment must be. I do not mean by drinking liquor, the taking of a glass of beer or wine at meals. It is not necessary for a man to be a total abstainer in order to be temperate. The rule should be: Never enter a barroom and never drink liquor except at meals.

"The second rock ahead is speculation. The business of a speculator and that of a manufacturer or man of affairs are not only distinct, but incompatible. To be successful in the business world, the manufacturer's and the merchant's profits only should be sought. The manufacturer should go forward steadily, meeting the market price. When there are goods to sell, sell them; when supplies are needed, purchase them, without regard to the market price in either case. I have never known a speculative manufacturer or business man who scored a permanent success. He is rich one day, bankrupt the next. Besides this, the manufacturer aims to produce articles, and in so doing to employ labor. This furnishes a laudable career. A man in this avocation is useful to his kind. The merchant is usefully occupied distributing commodities; the banker in providing capital.

"The third rock is akin to speculation—indorsing. Business men require irregular supplies of money, at some times little, at others enormous sums. Others being in the same condition, there is strong temptation to indorse mutually. This rock should be avoided. There are emergencies, no doubt, in which men should help their friends, but there is a rule that will keep one safe. No man should place his name upon the obligation of another if he has not sufficient to pay it without detriment to his own business. It is dishonest to do so. Men are trustees for those who have trusted them, and the creditor is entitled to all his capital and credit. For one's own firm, 'your name, your fortune, your sacred honor;' but for others, no matter under what circumstance, only such aid as you can render without danger to your trust. It is a safe rule, therefore, to give the cash direct that you have to spare for others, and never your indorsement or guarantee."

Progress of American Steel.

An interesting feature of the recently published statistical report of the American Iron and Steel Association is the increasing percentage of steel in the total production. About one-third of the bar "iron" now manufactured in the United States is steel, so is nearly half of the plate and sheet iron, and 40 per cent of the cut nails and spikes. The rolled iron product, other than nails, only increased 7½ per cent last year, while the rolled steel product, apart from rails, increased 32 per cent. It needs not to say that steel rails are now replacing those of iron on all the railroads which are efficiently managed. After that change is completed, what then? Will the next reform in order be wholesale substitution of aluminum for the ferric material, crowding that out of the way as the latter is displacing wood for many structural purposes? It is not improbable. Clay is much more plentiful than iron ore, and recent experiments at least indicate it as possible that the new metal will ere long be produced as cheaply per unit of volume, if not of weight, as its elder brother. Such a change would revolutionize not a few of our manufacturing processes, and perhaps some of the habits of the civilized human being.—*Metall und Eisen Zeitung.*

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A RESIDENCE AT PORTCHESTER, N. Y.

Our engraving illustrates an attractive country house erected for Douglas Sloane, Esq., at Portchester, N. Y. Dimensions: Front, 47 feet; side, 43 feet 6 inches, not including piazza. Height of ceilings: cellar, 8 feet; first story, 10 feet; second story, 9 feet 6 inches. First story to tower and chimney place is built with stone. The first story is covered with clapboarding, painted dark olive green; the second story shingled, painted tile red. Roof shingled and painted red. The hall (12 feet wide) is finished in white and gold, and it contains an elegant staircase, same finish. The drawing room is finished in the "Renaissance" style, provided with a large open fireplace, with hearth and facings laid with white tiles, an elegant carved mantel, three windows at side of fireplace, with transoms, glazed with cathedral glass. The library is trimmed with cherry, dining room oak. The buffet in dining room is a pretty feature, with doors glazed with beveled plate glass. The kitchen and butler's pantry are wainscoted and trimmed with whitewood, finished in the natural. The second floor contains four bed rooms, dressing room, and bath room, the latter wainscoted with oak and fitted up complete. Four bed rooms, billiard room, and bath room in attic. A cemented cellar under whole of house, and it contains a laundry. The house is provided with furnace, electric bells, and speaking tubes. The cost was $11,500. Lamb & Rich, New York, architects. Our engraving was made direct from a photograph of the house taken especially for the February, 1890, ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN, which number also contains the plan views.

RESIDENCE OF MR. DOUGLAS SLOANE, AT PORTCHESTER, N. Y.

Patents and Monopolies.

There is one great American industry which, though it was in a flourishing condition a few years ago, seems to have declined, until we hear comparatively little of it in these days. This industry had no particular location, but flourished in all parts of the country, and was carried on by smooth-tongued individuals, who drove about among the farmers, and swindled them in various and ingenious ways, too numerous to mention. In many of the tricks by which this was done, patented machinery of various kinds played an important part, though the facility with which the shekels of the guileless agriculturist were obtained by tricks involving the pretended purchase of chickens and similar things showed that machinery or patents were not considered by the operators to be a necessary feature of the business. Nevertheless, patent rights figured in these transactions sufficiently to give many of the farmers the idea that the whole patent business was nothing more nor less than a gigantic scheme to enable sharpers to swindle them. Inventors became in their eyes mere cormorants, or blood suckers, that the community would be well rid of, and now that it has become plainly apparent that something is the matter with the American farmer, he is inclined to lay it partly to patents and inventors.

A convention of farmers recently held in the West demanded that the rights of patentees in new inventions should be limited, and the time of their exclusive privilege shortened. There is among other classes of people, also, a disposition to attribute many of the real and imaginary evils which afflict us to the same cause, but that things would be helped by a curtailment of the present rights of inventors and patentees we cannot believe.

It is undoubtedly true that patents are in many instances made use of as a help in extorting money from the public, for which no fair return is made, but it by no means follows that relief would be obtained by striking at inventors. Plenty of the most oppressive monopolies with which we are afflicted are not founded upon patents at all, but would go right on, and flourish, were all patents abolished. With the facilities for forming monopolies which seem to be furnished by our social organization, it is difficult to mention any features of that organization which may not be made a means for increasing the power of monopoly. The greatest monopolies have their origin, not in the lack of legislation to protect the people, but in legislation which is intended to and does actually give an advantage to one citizen or class of citizens over others. Let the farmers and others who complain of the oppression caused by patent rights look about them, and see who it is that has all the good things of this life, without performing the least service of any kind in return therefor. When they have found these persons, and noted the basis upon which their privilege rests, there may be less disposition to complain of the comparatively small amounts made out of patented inventions. For it is always to be remembered that the granting of a patent gives a monopoly of the one thing patented only, and that thing is a something which the world up to the time of the granting of the patent has been getting along without, and not only can, but will continue to get along without, unless terms can be made with the inventor which are mutually advantageous. The patenting of the reaping machine did not destroy the cradle nor render it any less effective as a harvesting implement. Any farmer who chose could continue to cradle his wheat, and would actually do so, unless he could obtain a reaping machine upon such terms as made it advantageous to him. And any farmer who chooses can hire men to bind his wheat instead of using a self-binding reaper, and every one of them will do it unless he can obtain the self-binding machine upon terms which are advantageous to him. He will not pay to the inventor and manufacturer of the machine all the advantage which he gains by its use, and it is plain that he would not do so, even if there were but one manufacturer of such machines, and therefore no competition, because, rather than do this, he will continue to do his harvesting in the old way, and will do so until the price at which the machine is offered enables him to profit by its purchase. The same principle will be found to apply to every patented invention. No patent gives to its holder a monopoly of any natural substance or product, nor of any opportunity for the application of wealth-producing labor which existed before the patent was granted. It gives a monopoly of that only which before was not in existence, and which men not only can, but will do without, unless they can obtain it by a payment to the inventor or his assigns of something less than the advantage to be gained by its use.

It must be plain, therefore, that for the privileges granted to an inventor by our patent laws, he must return more than a full equivalent to the community in every case except where his invention passes into the hands of a company powerful enough to monopolize its advantages, in which case the thing to contend against is the condition which favors the formation of such monopolies, not the inventor. In fact, it has been shown in numerous instances that new inventions constantly coming into use, and which it is fair to assume are stimulated by the security offered by the patent office, are the most effective check upon monopolistic operations, and gave the best means of successful competition with them.—*American Machinist.*

The Deadly Tape Worm.

More defalcations, more failures, more banks burst wide open, more cashiers and trusted managers gone to parts known but non-extraditing. What's the matter? Tape worm, that's just what it is! That narrow strip of paper that endlessly uncoils and glides out from under the ticker! Sooner or later it fetches them all. If we had a controlling or influential interest in an insurance company, and any one connected with it and having access to its cash drawer or its bank account or its convertible securities should be found hanging over one of these clicking devices of the devil, listening to its lies about fortunes made in a day, that fellow, whether he was president or errand boy, should be bounced! Nobody who is fed upon by this deadly parasite, the tape worm of the stock indicator, ought for a single day to be suffered to hold a place as custodian of other people's money.—*Insurance.*

IT is stated that one grain of pilocarpine in a half ounce of vaseline applied to the scalp will prevent baldness.—*Gaillard's Medical Journal.*

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SOME THINGS IN WIRE.

There is scarcely a limit to the number of useful and ornamental things that can be made from wire. Two examples are shown in the engravings, Figs. 1 and 2 representing respectively front and edge views of a newspaper and magazine holder formed of a wooden back and wire scrolls; Fig. 3 showing a small wire stand or card receiver having a zylonite top.

The scrolls of the newspaper holder are formed of three-sixteenths inch square brass wire; the several pieces being bent in the form shown and held in place by clips of the same material soft-soldered by means of a blowpipe. The overlapping portions of the scrolls are also soft-soldered. The lower part of each main scroll is held by a strong staple passing over the wire of the scroll and through the cleat and backboard and clinched on the back of the board. The three wires at the center of each scroll are prolonged below the cleat, as shown, to form a stop for limiting the swing of the scroll.

If care is taken in soldering the clips, the brasswork will require little preparation for lacquering. A stiff brush charged with finely powdered pumice wet with water and applied vigorously to the work will quickly remove all stains, and will give the work a uniform appearance. The backboard, which may be of walnut, mahogany, cherry, oak, ash, or maple, should be varnished and well rubbed down before the cleats are applied.

A holder of this kind will receive a large number of periodicals.

The wire stand or card receiver, shown in Fig. 3, is made of one-quarter inch or three-eighths inch round brass wire. It may be made of brass tubing three-eighths inch or one-half inch outside diameter and rather thick. In this case the tubes are annealed and filled with lead before bending. The lead is melted out of the tubes after bending. The spirals are formed separately by wrapping the tube or wire around a cylindrical bar of wood or iron in a close helical coil, then stretching out the coils, placing them together, as shown. They are then clamped on a smaller cylindrical bar and their upper ends are twisted together. Two rings surround the lower part of the spiral, and to these rings are secured the legs by means of solder or screws.

The small rings surrounding the legs may be purchased and secured in place by solder.

The top of the stand consists of a disk of wood, concaved at the top and furnished with an embossed disk of zylonite.

The under surface of the stand top is provided with a perforated block, which fits over the closely twisted end on the standard. This receiver may be made so small as to stand upon a table, or it may be made of the usual table height.

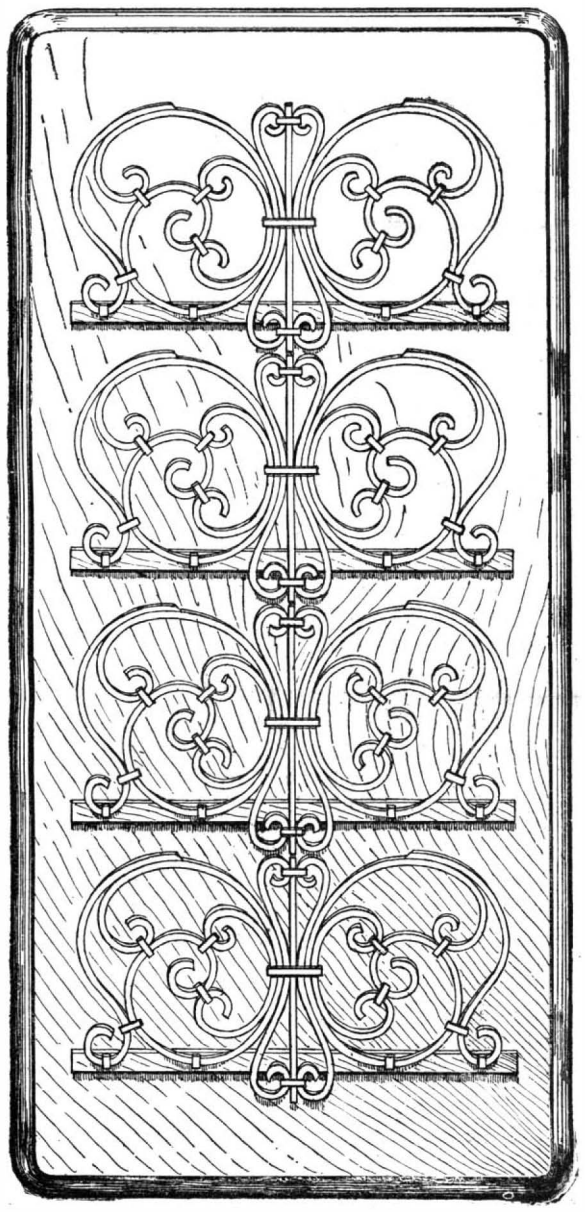

Fig. 1.—NEWSPAPER HOLDER.

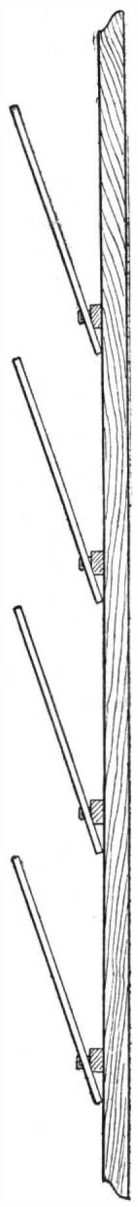

Fig. 2.—EDGE VIEW OF NEWSPAPER HOLDER.

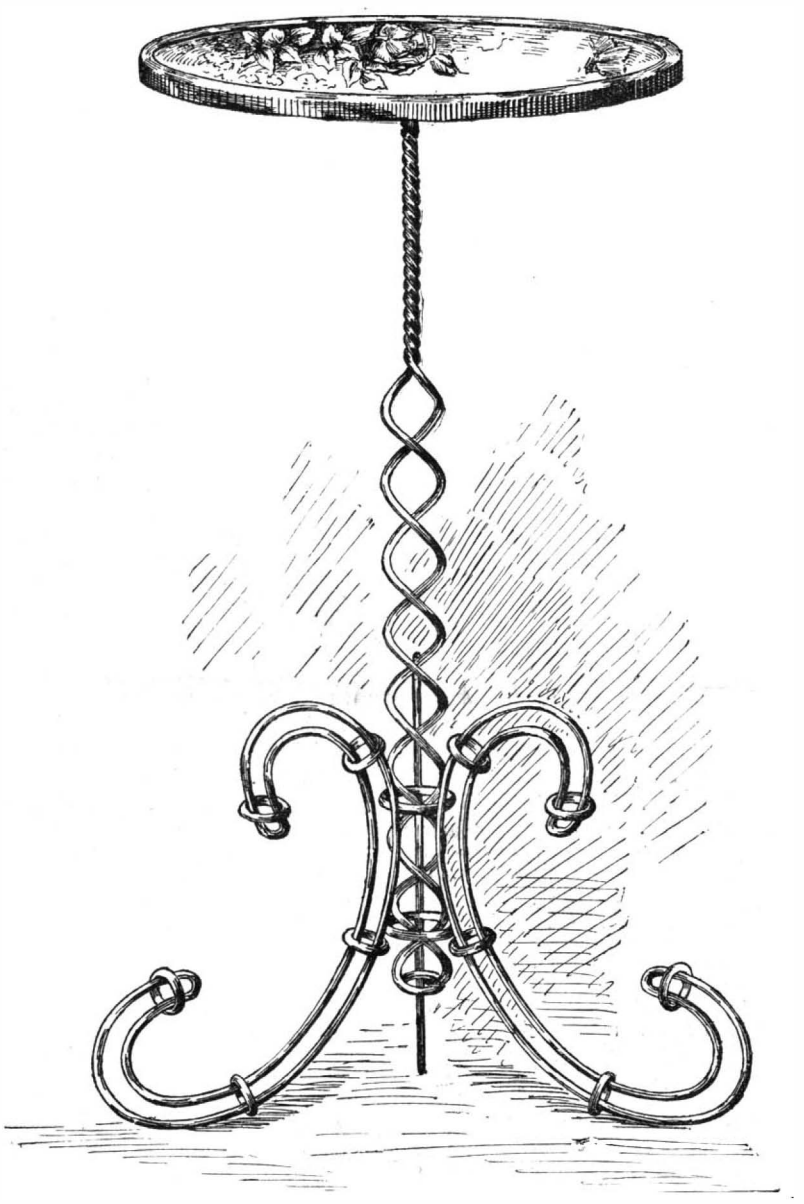

Fig. 3.—WIRE STAND OR CARD RECEIVER.

Action of the Soil on Pathogenic Germs.

Pathogenic germs evidently exist in the soil. The bacilli of tetanus, typhus, and cholera have been observed, and it is probable that the bacillus of tuberculosis, the pneumo-coccus, will be found.

The superficial strata of the earth are extremely rich in pathogenic germs. At a certain depth there is a limit beyond which the number of germs rapidly diminishes, until they cease altogether.

In the deep strata of the bacilliferous zone, pathogenic species do not exist. Grancher and Deschamps have observed the arrest of the typhus bacillus at a depth of 50 centimeters. In the cultivated superficial strata there are fewer micrococci than bacilli. The bacilli exist in the soil chiefly as spores. Under this form they best resist destructive agents, and may remain latent for years, retaining their virulence.

It is probable that the pathogenic bacilli germinate in the soil.

The cholera bacilli form numerous colonies at a depth of 3 meters during the months from August to October; from April to June, at a depth of 2 meters there is no development, while at a depth of 1·50 meters the bacillus vegetates. At least 2 per cent of humidity is necessary for the development of the germs. Soil rich in organic material is most favorable to this development.

Causes of death of the pathogenic germs exist in the soil. The principal cause is exsiccation. Koch and Duclaux have demonstrated that this is especially hurtful to the micrococci, and here, according to Koch, is the explanation of the fact that micrococci are relatively rare on the superficies of the soil. The cholera bacillus dies rapidly under exsiccations. Netter fixes three weeks as the extreme limit at which the exsiccated pneumo-coccus preserves its virulence.

The two most potent causes of destruction which the microbes encounter are the saprophytic bacilli and solar light.

The saprophytic bacilli are in continual strife with the pathogenic microbes, and have generally the advantage. The bacillus of tetanus is exceptional, and may develop favorably in the presence of other species.

Solar light is injurious to very many bacilli. According to Duclaux, it is the most universal means of sanitation, and the most economical and potent to which public or private hygiene can have recourse.

The turning up of the soil liberates pathogenic germs, but when the soil is not disturbed for a long time, a colossal germination frequently goes on. Exhumation frees the bacteria long latent in the soil. Hence the epidemics that follow the turning up of the ground. Pathogenic germs leave the earth in many ways to attack men and animals. The soil which adheres to the body, to the feet of animals, and that which is carried by insects disseminates pathogenic germs. Currents of air transport superficial dust, and so propagate the spores which resist exsiccation. Water also carries germs.

Ordinarily, subterranean waters are on a level with the bacteriological zone. Sometimes this zone is exposed by fissures or by openings made in the earth. The walls of a well are a prolongation of the superficies, and are favorable to the life of the germs.—*The Sanitary News.*

The Panama Canal Again.

The report of the Commission of Engineers to the liquidator of the Panama Canal threw some light on the true situation as far as the condition of the work done and to be done on the great ditch is concerned, and now we are likely to have another inquiry which promises to be equally interesting and instructive. The unfortunate shareholders in De Lesseps' enterprise have petitioned the French Chamber, praying that the liquidator of the defunct canal company be required to make an exact statement of the expenditure of the money confided to M. De Lesseps and his co-directors, showing how much was spent on actual work at the Isthmus, with prices of the respective contracts, and how much was frittered away in secret service, home commissions, press subsidy, etc.

The petition suggests that, as the shareholders were practically induced to part with their money upon false representations, the amount of money subscribed being more than double that stated by M. De Lesseps to be sufficient for the completion of the work, the government should, through the Minister of Public Justice, recover for the shareholders, as in the case of the Comptoir d'Escompte, an indemnification from the directors of the canal company. The committee to whom the petition was referred has in its turn admitted the principle on which it is based, and has turned it over to the Minister of Justice to take action upon if he approves, so that, judging from the impartial investigation of the courts into both the Comptoir d'Escompte and the Societe des Metaux scandals, the *Engineering and Mining Journal* thinks a thorough investigation will now be made.

A REDWOOD tree, 90 ft. in circumference and 33 ft. in diameter, is being cut for the Chicago exhibition. The section to be sent to Chicago will be 9 ft. in height and 60 ft. in circumference, and will weigh 65,000 lb. The tree is taken from the forests of Tulare County.

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California Asphaltum.

Asphaltum is mined to a considerable extent in California, but the annual production is quite irregular, being governed by the local demand. When a great deal of iron pipe is being laid, large quantities of the substance are used in coating it. Asphaltum is found in the counties of San Luis Obispo, Santa Clara, Ventura, and Santa Barbara. Between 2,000 and 3,000 tons a year are shipped from the deposits.

The mines of the Ventura Asphalt Co., in the Canyon Diablo, Rancho San Miguelito, have come into prominence since 1888, when they were discovered. The material is found at or near the surface. About 1,800 tons have been so far shipped from this deposit. More or less prospecting work has been done, but now large cuts or tunnels are being run into the deposit. At the point now being worked the elevation above sea level is 1,300 feet, but frequent fossils of shells, sharks' teeth, etc., are found, showing that the mass came up from the ocean.

The vein or bed crops out at many points in the shape of fingers or rounded masses connecting with the main body, the width and length of which are unknown, but upon which breasts of 45 × 16 feet have been worked.

The quality of this asphaltum is unique, possessing as it does great toughness and hardness, and a larger amount of fixed bitumen than other known deposits. The percentage of fixed bitumen is 24·40. It fluxes readily in oils, coal tar, and by hydrocarbons, and may be made permanently of the hardness of stone or the pliability of India rubber, according to kind and quantity of flux (solvent) employed and the manner and time of melting, etc.

It has been successfully employed in street paving, and is found not to soften by heat or crack by frost. It is in use for this purpose in several cities in California, Utah, Washington, British Columbia, Mexico, Guatemala, Sandwich Islands, and Australia. For cementing masonry it has been put to use in San Francisco, Santa Barbara County, and other places. The Southern Pacific Co. built a piece of sea wall along the seashore, Ventura County, which was built up of round cobbles cemented together by this asphalt. Two years' trial shows no indications of the wall being injured.

A peculiarity of the Ventura County asphalt is that it is elastic. The Santa Ana Water Co. used it for plastering a reservoir, having first laid up a wall of cobblestones on puddle and then plastering this with hot asphalt. In this open reservoir no change in the material is seen; even in places where the wall settled and cracked, the coating stretched and bent, remaining perfect and sustaining the water pressure. A pile coated with this asphalt was driven at Goat Island without destroying the coating. In doing this, the weight of 3,000 pounds was dropped 22 feet on the pile. The material can be used for coating iron, planks, pipes, etc. Inquiries for the substance from the Eastern States, England, France, Australia, and Central America promise an important shipping business, unless other deposits with such exceptional properties are found.—*Min. and Sci. Press.*

The Thunder Storms.

It is probably idle to tell people that there is a thousand times the danger in the sewer pipes that there is in the thunder clouds, but it is true all the same. The deaths by lightning are few indeed. Who of the readers of this paragraph, says the Hartford *Courant*, ever lost a friend that way? Who of them hasn't lost a score of friends by the less brilliant and less noisy destruction that comes up out of the drains? The trouble with the lightning, or the trouble that it gives the people, is in its indescribable suddenness and its absolute uncertainty. You know neither when it is coming nor where it is going, all you feel certain about is that every storm is pretty sure to leave a number of catastrophes to mark its course. The caprice of the lightning defies the explanations of science, and there is no predicting beyond a few generalities. This much it does seem safe to repeat, even in a lively lightning season, that the increased use of electricity, with the multiplicity of wires, has tended to fewer fatal strokes of lightning in cities.

In the storm a week or more ago in Hartford, a bolt burst near the *Courant* building, which shivered a few chimneys hereabout, but evidently lost most of its energy in dancing over telephone and telegraph wires. Moreover, a great deal of electricity undoubtedly works off quietly by such avenues and by lightning rods without a manifest disturbance. But all in all, it is a subject and an agency that people know comparatively little about. Our thunder storms come majestically along, the lightning plays about in the clouds, and now and then a bolt goes down to the ground or up from the ground to the clouds. But often there are equally severe electric storms when there are no clouds, and when the disturbance is in the earth itself. The telegraph and telephone are thrown into confusion, while the "spectator" sees nothing and knows nothing of what is going on, though he may feel the effects of the current in his mental condition without knowing its cause.

Gold by Electricity.

The last number of the Pall Mall *Budget* received at this office describes as follows an invention recently patented in England, by Mr. Molloy, a member of Parliament, for separating gold from the ore by electricity in connection with mercury.

Mercury, of course, is man's greatest ally in the work of getting gold out of ore. Its affinity for the precious metal has been known and used for a thousand years. Having crushed your ore to powder, a simple process in which the "gravitation stamp" is only the stone-breaker's hammer of the roadside multiplied by the power of machinery, you pass this powder by means of a shallow flow of water over copper plates faced with the compelling mercury. Each minute particle of gold which is thus brought in contact with the mercury is absorbed by it, and goes to form an amalgam of mercury and gold. Then all you have to do is to scrape your amalgam off the plates, put it into a crucible, and apply sufficient heat. Away goes the mercury in the form of a vapor, which subsequently regains its original form and lives to fight another day. What you are left with in the retort is pure gold. There are, however, two difficulties, the familiar bugbears of every mining community.

1. The difficulty of bringing every particle of gold into contact. Th mercury does not attract the gold as a magnet would iron. If the particles of gold come and touch it, it gobbles them up, but it declines to go running after them. Now, if you don't crush fine enough, many of the particles will carry a speck of gold within a shell of ore. In that case the mercury cannot crack the nut, and it flows away, kernel and all, into the "tailings." If, on the other hand, you crush too fine, you get "float gold," that is, particles so tiny that they are carried on the top of the water without touching the mercury at all. But even if this difficulty be overcome, and contact with the mercury secured, you have a second to face.

2. The demoralization of the mercury itself from contact with the ore. There are certain "refractory" ores which contain properties inimical to mercury (such for instance as arsenic, iron oxide, sulphur, antimony, or zinc), under the influence of which the mercury oxidizes. It "sickens," as the miner puts it, and "flours," forming into a sort of scum on the surface which interposes between the "quick" mercury and the gold with which it ought to be in contact, and which also keeps flaking off and running to waste with the water. In this way not only is there a great loss of gold, but there is a loss of mercury, too, which is not the least part of the miner's trouble, seeing that it is a most expensive metal.

On these two difficulties, in many cases, depends the question whether a gold mining enterprise does or does not pay. It is clear, then, that to dispose of them forever would mean something like a happy revolution in the conditions of the industry. And that, no less, is Mr. Molloy's ambition. What he claims for his invention is shortly this, that it keeps the mercury absolutely "quick," and insures the absolute contact with it of every particle of gold. The point at which Mr. Molloy steps in is after the crushing of the ore. His invention is a substitute, not for the "stamps," but for the "plates." As, however, for his purpose, the finer the ore is crushed the better, he prefers a crushing apparatus consisting of two great rollers playing in a circular box, with the double action of a carriage wheel when the carriage is both moving and turning round. That, however, is nothing to do with his invention, which I will now describe.

Reduced to its simplest elements, the machine is an iron disk spinning in a shallow iron saucerful of mercury, on the surface of which the disk floats. In the middle of the disk is a hopper, through which the flow of water and crushed ore descends upon the mercury. There the centrifugal force due to the rotation of the disk drives it from the center to the rim, pressing it down upon the surface of the mercury all the time, and insuring that every particle of gold shall be absorbed. The residue is driven to the edge of the saucer, and there, freed from the pressure of the disk, it continually wells up, overflows, and runs away as "tailings." All you have got to do, then, is to crush as fine as possible to begin with.

The bugbear of "float gold" loses its terrors. However light the particles may be, they are spread, and squeezed, and scrubbed, and radiated over the surface of the mercury between it and the revolving disk which floats upon it. So much for difficulty No. 1. As for No. 2, Mr. Molloy appeals to the powers of chemistry and electricity to rescue him from that. He cannot prevent the hostile elements in "refractory" ore from coming in contact with his mercury, nor can he deprive them of their "sickening" influence. But he can prevent the mercury from oxidizing under that influence by keeping it constantly charged with a supply of nascent hydrogen which has absolute power to cure, to counteract, and to prevent its oxidation. Nothing easier. In permanent contact with the mercury he places a solution of certain salts. This solution is connected with the positive pole of a battery, the negative pole of which is connected with the mercury.

Under the influence of the electric current the solution is being constantly decomposed, sending a constant supply of oxygen into the air and a constant supply of hydrogen into the mercury. This being all a bubble with nascent hydrogen never gets a chance of "sickening," but is always kept "quick" and fit for work. This electrical process Mr. Molloy manages in the center of his gyrating disk, the solution being contained in a sort of little ebonite moat within the hopper. One horse power suffices to drive both the machine and the dynamos required for the electrical process, and it can put through ten tons in a day. The salts required are "dirt cheap," and the mercury practically lasts for ever, and the whole apparatus weighs only five hundredweight.

Rumination in Man.

"By rumination, or 'chewing the cud,' we designate a condition in which the food returns, without nausea, in small portions, from th stomach, through the œsophagus into the mouth, some time after meals; here it is chewed anew and swallowed.

"Rumination belongs to the normal physiological processes of most herbivora, and forms the most marked characteristic of the whole class of mammals which we call 'ruminants.'

"Here the rumination is a most appropriate arrangement. The herbivorous animals are obliged to partake of great quantities of food, as the nourishing value of the grasses is relatively a small one. On the pasture they must make use of their time for gathering and swallowing the grass. Afterward, when they have more time and leisure, they reduce the food to smaller particles and mingle the same with saliva, by the act of rumination.

"In view of this circumstance the stomach of ruminating animals differs in construction from that of other animal classes. It consists of four compartments: Paunch, or rumen, honeycomb bag, or bonnet, manyplies, or psalter, and reed, or rennet. The first two serve more or less as reservoirs, whereas the two latter contain the glandular elements for digestion.

"At the first act of swallowing, the food materials enter the rumen and the bonnet, whereas after chewing the cud the food passes directly into the psalter and rennet.

"Chewing of the cud, which is so very important and appropriate for the whole class of ruminants, occurs, though quite rarely, in man, and is designated then as rumination or merycism.

"For man rumination is unnecessary, and more or less a hindrance. One can hardly define rumination as a disease, for the bodily functions are in no way harmed by that process, but as an abnormal, anomalous condition, which must be socially an uncomfortable and disagreeable burden to its owner."

The above is extracted from a paper read before the German Medical Society of New York by Max Einhorn, M.D. The learned doctor described a number of cases of rumination in man, which had come under his knowledge, and he quotes from a large number of authorities on the subject, dating back to the year 1618.

Rumination, as treated in Dr. Einhorn's lecture, is very interesting, and appears in full in the *Medical Register* of May 17.

Fictitious Dividends.

Were the law in France in relation to the payment of fictitious dividends in force in this country, the *Railway Review* thinks, the social status of our State prisons would be considerably elevated by the influx of a large number of now reputed respectable citizens. It was only recently that the head of a large company in France, together with his other directors, were sentenced to a severe fine and term of imprisonment for the offense of declaring a fictitious dividend. France is evidently behind the times, or else we are. The practice of declaring and paying dividends with borrowed money has become so common in this country as to attract no more than passing notice, and it is to be feared that were the French law in force, very many stocks which are now sustained by a process of that kind, in order that present holders may unload on favorable terms, would soon seek their natural level, although their promoters might at the same time be forced to take up a temporary residence at some public institution at the expense of the State.

Snuff for Colds.

Dr. C. H. Stowell, of Washington, recommends the following in place of solution of cocaine:

Sodii bicarb.	ij grs.
Magnesiæ carb. (levis)	iij "
Menthol	j "
Cocaine hydrochlor.	iv "
Sacch. lactis	iss 3

M. Sig.: Use as snuff.

The most marked relief, says the *Chemist and Druggist*, will follow the use of this powder, and a few applications will do much to abort the catarrhal attack. Its effects are immediate, highly agreeable to the patient, and continuous for a number of hours.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Albert N. Hopkins, Duluth, Minn. This is a coupling designed to be entirely automatic and to be readily coupled with the ordinary link and pin coupling, the forward end of each link being beveled, so that in coupling one will ride over the other and the under one will catch behind a lug to couple the cars, the invention also covering other novel features and combinations of parts.

RAIL JOINT.—Joseph D. Greene, Marshall, Mo. This is a joint of that class which has two sections adapted to grip the opposite edges of the base of the rail, and which are movable longitudinally, one of the sections being held by a lug between the jaws as against longitudinal movement along the rail while the other section is being moved longitudinally to adjust the two sections tightly against the rail.

Agricultural.

HARVESTER.—Herman A. J. Rieckert, New York City. This is a machine in which part of the grain cut is formed into a band to tie the sheaf, the invention being an improvement on a former patented invention of the same inventor, making the machine automatic and very effective, and in which the grain is readily cut, formed into sheaves, and a part of it used for automatically forming bands, which are automatically tied around the sheaves, so that the latter are discharged in perfect shape.

SELF BINDER.—Herman A. J. Rieckert, New York City. This is a machine designed to use a prepared straw band, and to be an improved self-binder which is simple and durable and very effective in operation, drawing the straw band tightly around the sheaf, and then rapidly and securely tying it.

HUSKING BENCH AND FODDER BINDER.—Parker J. Miller, Mount Gilead, Ohio. This is a combination device, designed to be readily folded up when not in use for storage or transportation, and especially designed to support the bundle of corn for conveniently husking and then tying the fodder, the device consisting of a frame having a central binding beam with a rope attached and a ring or stirrup on the free end of the rope.

CULTIVATOR. — Richard Cracraft, Abingdon, Ill. This is a machine especially adapted for use wherever shallow culture is desired, having a diagonal blade for loosening and throwing the earth to one side, while the landsides are omitted from the plow-like blades, which work in opposite directions, so that side draught is completely overcome, and the beam may be readily secured to any carriage capable of drawing a cultivator or plow.

Miscellaneous.

CLOTHES DRIER.—Benjamin F. Fuller, McMinnville, Oregon. This is a rack formed of an extensible bar with sections sliding one upon the other, one of the sections carrying a windlass, in connection with a rack head or bracket, and various other novel features, the device being designed to conveniently hold clothes for drying and airing, and to be simple and readily adjustable.

TOY GAME APPARATUS. — Mary P. Stewart, Washington, N. J. This apparatus is made with two intersecting channels, in one of which a plunger is held to slide, while in the other channel is a spring-pressed gate connected with the plunger, one of the channels being set in an inclined position, the game being played with balls by the alternate pulling and releasing of the plunger.

LOCK.—Patrick McMahon, Whitestone, N. Y. This is a cylinder lock containing but one cylinder, and having the tumblers so arranged that by increasing or decreasing its length an indefinite set of combinations may be produced, the construction being such that a master key may be made to fit and manipulate all the locks having the improvement.

GUN RACK FOR TENTS. — Benjamin Watson, Glen Hazel, Pa. This invention consists of two clasps adapted to be attached one above the other to the tent pole, the upper clasp having swinging arms to be retained in horizontal position and with holes in the bottom to receive the gun barrels, while the lower clasp has swinging arms with slotted sides to receive the butts of the guns.

DESIGN FOR WEAR PLATE FOR BOOTS, ETC.—Louis N. Beauchemin, Tacoma, Washington. This invention covers a two-part wear plate, a sole part and a heel part, the sole part having the normal shape of a sole, with approximately half moon shaped openings at the ball and toe, the heel plate having one similar central opening, and both parts being provided with spike-shaped protuberances.

VEHICLE SEAT. — Thomas J. Kerstetter, Fern, Pa. This invention covers the use of spring arms by which to support the back bar, and a holding frame adapted to secure such arms, made in sections and adjustable, whereby the back bar of the seat can be held in different positions and yield with a spring action, rendering riding more easy and comfortable.

TRACE CARRIER.—Alexander P. Waddell, Union City, Tenn. This invention covers an improved buckle, the plate or frame work having cross bars at its upper and lower end and having hooks on its front face, a portion of the rear side of the frame being provided with spurs, and having a trace link or receiver.

CHURN. — Columbus Miller, John W. Blue, and Charles S. Miller, Keystone, Mo. This churn has an inner and onter dasher section, the shafts operating which are turned by gearing in opposite directions, the sections being so constructed as to break up every particle of the milk and cream, while there is below the churning chamber a water-receiving chamber.

FEEDING OIL TO LAMPS.—Vincent Di Marzo, Louisville, Ky. This invention covers an apparatus consisting of pipes connected to an oil reservoir with which a water reservoir is also connected at the bottom, a weighted gravitating plunger being employed for forcing the oil through the pipes to the lamps, while a regulator is placed in the pipe leading to the lamps to keep the level of oil at the proper limit.

SAWING MACHINE.—Henry C. Green, Anniston, Ala. Combined with a main frame and lever frame secured thereto is a saw blade, the levers being arranged in series and connected at one end to the saw blade and at the other end to the main frame, an operating lever being adjustably pivoted between the uprights of the lever frame, with various other novel features.

INDEX. — Nathan B. Shyer, Hopkinsville, Ky. Combined with a suitable frame or casing are leaves hinged or pivoted therein and arranged to fall forward when released, the leaves being normally held closed by a latch, while a button is arranged to turn in front of and hold up any one of the leaves.

ADVERTISING OR DISPLAY DEVICE.—Andrew Dahlstrom, Ashton, Mich. This is a device more especially designed for use in the dining rooms of hotels, etc., to be made in the shape of a caster or to be connected with a revolving table or platform for use in exhibiting articles of merchandise.

POST HOLE DIGGER. — Samuel H. Gregg, Crawfordsville, Ind. This is a device with jaws having back and side plates, the back plates being flat and straight and the side plates projected inwardly from the back plates, and tapered, the jaws being pivoted together, to present the least difficulty in being forced into the ground when open, and to entirely inclose the soil, so that the hole may be easily and completely cleaned of the loose dirt.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

For Sale—New and second hand iron-working machinery. Prompt delivery. W. P. Davis, Rochester, N.Y.

Acme engine, 1 to 5 H. P. See adv. next issue.

Tuerk water motors at 12 Cortlandt St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J

Hoisting Engines. The D. Frisbie Co., New York city.

Platinum scrap, old wire, etc., bought, Willis & Clements, 39 S. 10th St. Philadelphia.

Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 155 machines in satisfactory use.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Beach's Improved Pat. Thread Cutting and Diamond Point Lathe Tool. Billings & Spencer Co., Hartford, Ct.

Veneer machines, with latest improvements. Farrel Fdry. and Mach. Co., Ansonia, Conn. Send for circular.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 173.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Linen and rubber hose, all kinds of belting, general mill and factory supplies. Send for catalogue and prices. Greene, Tweed & Co., 83 Chambers St., New York.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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SCIENTIFIC AMERICAN BUILDING EDITION.

JUNE NUMBER.—(No. 56.)

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1. Plate in colors of an elegant residence at Montclair, N. J. Munn & Co., architects, New York. Perspective view, also a plate showing the north and rear sides, floor plans, sheet of details, etc.
2. Elegant colored photographic plate, with floor plans, sheet of details, etc., of a cottage at Blythebourne, L. I. Estimated cost $3,200.
3. Residence at Yonkers, N. Y. Perspective view and floor plans. D. & J. Jardine, architects, New York. Cost, $10,950.
4. A residence at Orange, N. J. Perspective views, floor plans, etc. Cost about $12,000.
5. Perspective view and floor plans of a residence at Holyoke, Mass. L. B. White, Holyoke, Mass., architect. Cost complete, $6,000.
6. Sketch of two old Bristol houses.
7. Sketch of hotel and Post Office, Dartmouth.
8. A Casino erected at Springfield, Mass. Cost complete $12,000. Floor plan and perspective.
9. A church recently erected at Greenwich, Conn., at a cost of $13,000 complete. J. C. Cady, architect, New York. Ground plan and perspective elevation.
10. View of the entrance to the United States Trust Company's building, Wall Street, New York.
11. A dwelling at Yonkers, N. Y. Cost complete $5,000. Floor plans and perspective elevation.
12. Elegant residence at Stamford, Conn. W. R. Briggs, architect, Stamford, Conn. Cost $15,000. Floor plans and perspective.
13. View of the iron and wood gate in front of the entrance to the Press Pavilion at the recent Paris exposition.
14. Miscellaneous Contents: Fireproofing wooden floors.—"Peach bottom" slate.—The manufacture of granite. — The lien law.—Combustible architecture.—Variety in Gothic architecture.—New No. 9 double cylinder planer and smoother, illustrated.—A sliding Venetian blind, illustrated.—The Holmes spur feed slitting machine, illustrated.—Get sound titles to your real estate.—Heating apparatus for a wagon factory.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 10, 1890.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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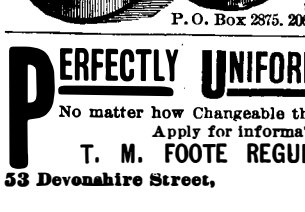

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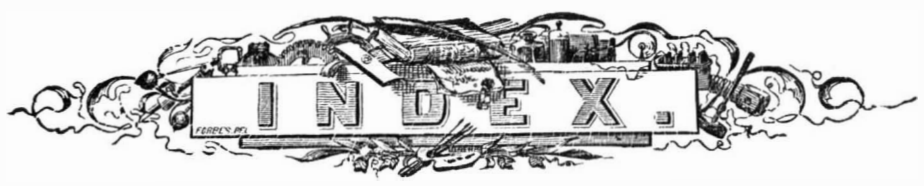

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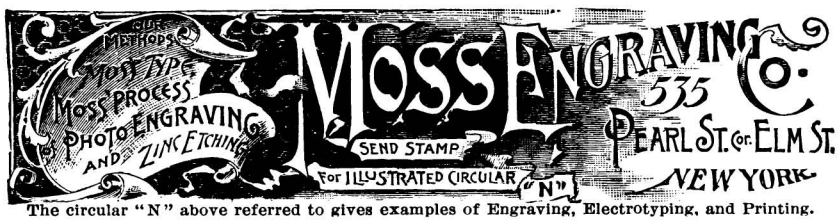
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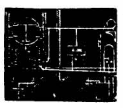

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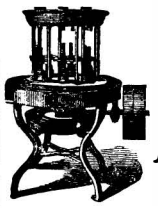

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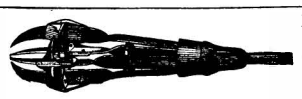

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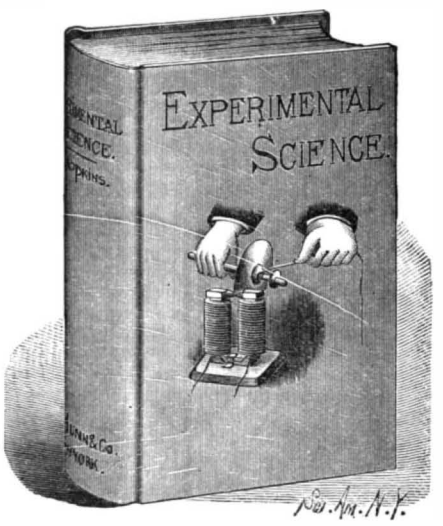

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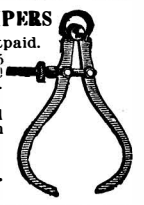

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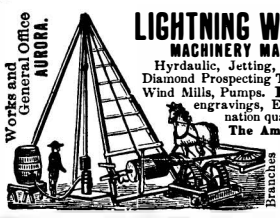

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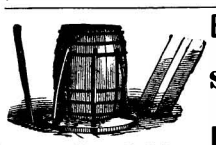

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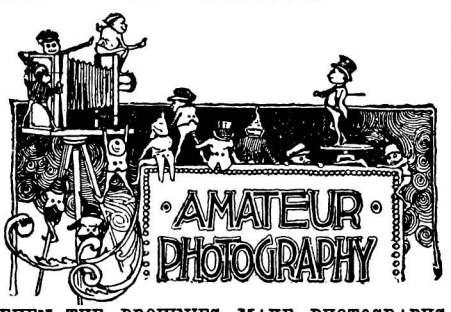

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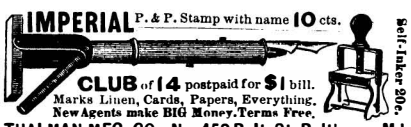

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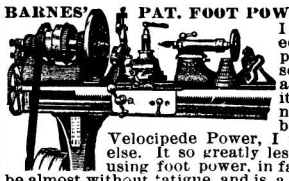

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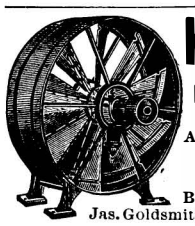

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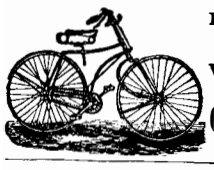

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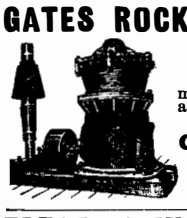

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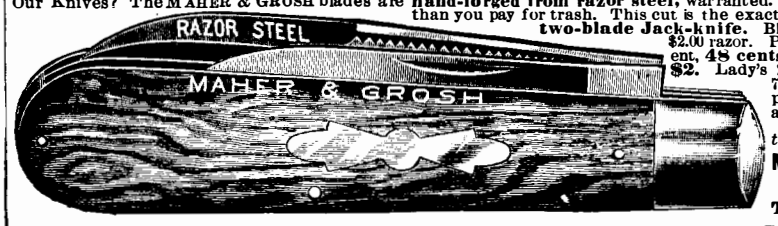

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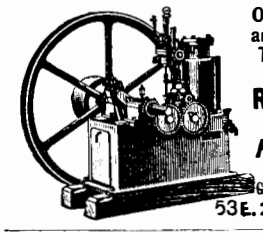

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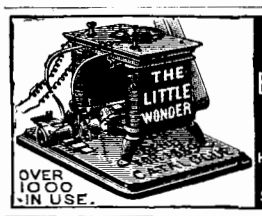

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